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Publications

MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF APPLICATIONS BY EACH OF

- (a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS CROWN LANDS WITHIN THE YUKON TERRITORY AND THE NORTHWEST TERRITORIES, and
- (b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS CROWN LANDS WITHIN THE NORTHWEST TERRITORIES

FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION, OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

December 16, 1975.

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PROCEEDINGS AT INQUIRY

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Volume 104







APPEARANCES:

Mr. Ian G. Scott, Q.C.,  
Mr. Stephen T. Goudge,  
Mr. Alick Ryder and  
Mr. Ian Roland for Mackenzie Valley Pipeline  
Inquiry;

Mr. Pierre Genest, Q.C.,  
Mr. Jack Marshall, and  
Mr. Darryl Carter for Canadian Arctic Gas  
Pipeline Limited;  
Mr. Reginald Gibbs, Q.C.,  
Mr. Alan Hollingworth &  
Mr. John W. Lutes, for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &  
Pro. Alastair Lucas for Canadian Arctic Resources  
Committee;

Mr. Glen W. Bell and  
Mr. Gerry Sutton, for Northwest Territories  
Indian Brotherhood, and  
Metis Association of the  
Northwest Territories;

Mr. John Bayly  
or  
Miss Leslie Lane for Inuit Tapirisat of Canada,  
and The Committee for  
Original Peoples Entitle-  
ment;

Mr. Ron Veale and  
Mr. Allen Lueck for The Council for the Yukon  
Indians;

Mr. Carson H. Templeton, for Environment Protection  
Board;

Mr. David Reesor for Northwest Territories  
Association of Municipal-  
ities;

Mr. Murray Sigler for Northwest Territories  
Chamber of Commerce.

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I N D E X

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WITNESSES FOR CANADIAN ARCTIC RESOURCES COMMITTEE:

Jeffery N. STEIN

Charles Edward WALKER

Lance William STEIGENBERGER

John M. MILLEN

- Cross-Examination by Mr. Bayly

15841,

15878

- In Chief (cont)

15870





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Steigenberger, Millen  
Cross-Exam by Bayly  
Yellowknife, N.W.T.

December 16, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: We'll come  
to order this morning.

MR. ANTHONY: Mr. Commissioner,  
I believe we were to continue with the cross-examination  
of this panel but I believe Mr. Bayly is going to pro-  
ceed now with his.

JEFFERY N. STEIN  
CHARLES EDWARD WALKER  
LANCE WILLIAM STEIGENBERGER  
JOHN M. MILLEN, resumed:

CROSS-EXAMINATION BY MR. BAYLY:

Q Mr. Stein, I wonder if  
we could start with you, sir, and looking at your  
evidence on the kinds of studies and the approach that  
you took, would you agree with me that there were  
various levels of study that you took, and they included  
in the first instance, surveys either from the ground or  
in helicopters?

WITNESS STEIN: Yes, that's  
true.

Q And when you talk about  
a synoptic helicopter survey, I gather that's a short  
one.

A It's very short, yes.  
Usually two days at the most.

Q And when you take a  
helicopter survey it only has real value in a clear water  
stream.

A Partially true; we can





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1  
2 still get information such as whether it's domestically  
3 fished, whether there are any natural blockages to  
4 fish migrations, this sort of data.

5 Q You referred as well to  
6 site specific information collected through a series of  
7 intensive stream studies. You haven't described those  
8 intensive stream studies and I wonder what they involved.  
9 Would you describe them, at least in general?

10 A Generally what we did was  
11 to select streams within each of the study regions that  
12 we had established on the Mackenzie, which hopefully we  
13 could take -- this was again after doing from one to  
14 two, depending on the site, one to two years of  
15 survey data, more or less -- after which we would select  
16 streams that we thought in our opinion at least  
17 were fairly typical streams in that region. We then  
18 attempted to establish a fish fence or a weir in that  
19 stream, and essentially stay with it for the full open  
20 water season, at least. In this way then we were  
21 able to actually monitor the fish coming into the  
22 stream, get a better figure on numbers than we previous-  
23 ly had. We would also be able to monitor out stream  
24 migration, in other words get, I think, much more  
25 detailed life history information than we would say in  
26 a synoptic survey type of operation.

27 Q All right. the synoptic  
28 survey, I gather, really only tells you where you can  
29 see fish, where some fish are at a particular time.

30 A The instances where you



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1  
2 are actually able to see fish are, I would suspect,  
3 fairly limited in number. You would also require a  
4 fair number of fish in one site. What you can get out  
5 of it is, through your sampling effort, an assessment of  
6 what species are there. You can get a crude assessment  
7 of what the relative abundance might be compared to  
8 other systems and the data you get from them. You can  
9 assess the state of maturity for the fish which would  
10 give you in some cases at least a handle on whether  
11 or not they potentially will be spawning in that  
12 system. You can get, if water conditions are favorable,  
13 an assessment of what we have classed as potential  
14 spawning areas, in other words gravel in our  
15 opinion or a sub-strait that in our opinion appeared  
16 to be suitable for spawning purposes.

17 Q So in some cases you  
18 might find an area in which there were no fish but  
19 which you would be able to say from your experience  
20 in other areas would be a likely place for fish to  
21 spawn, as an example.

22 A Well, you could still say  
23 "yes", that it is a likely place for fish to spawn.

24 Q That's what I'm saying.  
25 You were, in other words, not just looking for fish but  
26 you were looking for areas in which you would likely  
27 find fish, at least at some times of the year.

28 A Right.

29 Q Now I gather neither of  
30 these two kinds of studies will tell you a great deal





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1  
2 about the dynamics of a species, that is their migra-  
3 tory routes and their seasons of spawning, where they  
4 over-winter, for example, what they do in the summer-  
5 time.

6 A Well, this is what I was  
7 referring to, as life history information, and yes,  
8 I think it will to a degree. It certainly has to be tied  
9 in with the information that say has been collected on  
10 the mainstem Mackenzie and what-not, that by having a  
11 weir in there, which essentially does not permit fish  
12 to go up or downstream unless they pass through that  
13 weir, then we should have a good handle on it.

14 Q All right; but what it  
15 does do is it tells you what happens at that particular  
16 site and when it happens.





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1 A That is correct.

2 Q And you have to do that  
3 at a number of locations to be able to start to put  
4 together the jigsaw puzzle of the life history, or  
5 you depend on somebody else's research to do that?

6 A To get the most ideal  
7 information, yes.

8 Q Now, at what point do you  
9 take the next step, or have you already taken it which  
10 will enable you to start to understand the interdependence  
11 of species in an aquatic ecosystem?

12 A Was that the interde-  
13 pendence?

14 Q Yes.

15 A Well, I am not quite  
16 sure what you are referring to here as interdependence.  
17 I would look at it from the point of view of feeding  
18 habits and that you would be collecting simultaneously.

19 Q You would be collecting  
20 those simultaneously at the sites in which you had  
21 the weir and the studies going on?

22 A Yes, you would dead  
23 kill a certain amount, a certain number of species  
24 or fish of per species, rather.

25 Q So in that specific  
26 location you might be able to tell where fish were  
27 feeding?

28 A The operation of the  
29 weir would not tell you where fish are feeding,  
30 no. It would tell you, as I say by taking a selected



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sample from the fish coming through. It would tell you what they are feeding on at that time. I should point out that the weir is not necessarily the only operation that is going on in that river at the same time. We would have additional sets whereby we would have, say, gill nets or seine sites perhaps above or below the stream -- or the weir, rather.

Q Now, I understand that as giving you that information at specific sites, but to follow some of the fish through their life histories would involve, I gather, not only following them in the streams off the Mackenzie, but following them out into the Beaufort Sea or into the coastal lagoons along both the North Slope and the Tuk Peninsula area.

A That is correct.

Q And was that done?

A Pardon me?

Q Was that done?

A We attempted to do that, yes, with varying degrees of success, which was the reason for establishing and maintaining the sampling sites throughout the Mackenzie as well. When fish would be coming through the weir, say, as they were going out we could -- either coming in or going out for that matter, apply tags and it was hoped at least that the additional sampling efforts up and down the Mackenzie system would then retrieve some of these tags and at least give you some estimate of how far they were ranging.

Q Now, the studies that you





1 were making were to try and fulfill the four objectives  
2 that you have outlined for us on pages two and three of  
3 your evidence, is that correct?

4 A That is correct.

5 Q And let's just have a  
6 look at those objectives. The first one is briefly, I  
7 think, to define the biology and life histories of  
8 all major fish inhabiting the region that you were  
9 studying, and it included a number of factors. Do you  
10 feel that you were successful in reaching this  
11 objective in the four year study?

12 A I would say that for the  
13 major species, yes, I feel we were fairly successful.

14 Q And when you say for the  
15 major species, what do you define as the major species  
16 and what is the criteria for deciding what a major  
17 specie is?

18 A I would say that a  
19 major specie or major species, rather, would be defined  
20 more or less in terms of abundance, and that would be  
21 abundance throughout the Mackenzie system, not, say, in  
22 a given specific area. In other words, you could say  
23 that broad whitefish are not found generally in the Fort  
24 Simpson area, but they are extremely abundant in the  
25 delta region. We would therefore consider it a major  
26 species.

27 Q So it is numbers --

28 A Primarily based on abun-  
29 dance, right. Numbers.

30 Q And so there are some





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1 species which you weren't satisfied on this  
2 perhaps because the numbers weren't large enough for  
3 you to gather the information satisfactorily, would  
4 that be fair to say?

5 A In some cases, yes, the  
6 numbers were not that sufficient; in others, such as  
7 the minnows they were abundant but we did not feel, when  
8 you look at it from the point of view of usage, etc.,  
9 that with the time and the manpower available that we  
10 could warrant spending extensive amounts of time  
11 studying these.

12 Q When you say that you were  
13 able to determine their food habits, at least of the  
14 major species to your satisfaction, was that the food  
15 habits at the areas that you studied them in, or would  
16 that be their general food habits all along their  
17 migration routes?





Stein, Walker  
Steigenberger, Millen  
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1 A I think we have a fairly  
2 good feel for their food habits within their entire  
3 range.

4 Q All right, so for the  
5 major species you feel that you are at least able to  
6 understand the interdependence between the fish and  
7 the life species that they feed on.

8 A Right.

9 Q Now the second objective  
10 was to determine the timing of fish migrations and  
11 major migratory routes used. How successful did you  
12 feel you were in that?

13 A Again I would say that  
14 we were quite successful, especially concerning the  
15 timing of fish migrations. I think we also have fairly  
16 good data on the major migratory routes used. The only  
17 area where this would be complicated would be say in  
18 the Mackenzie Delta, where you do have such a multitude  
19 of channels and it's difficult to really put your finger  
20 on the significance of each one.

21 Q So there may be some  
22 blanks, you may know where they came in through Mackenzie  
23 Bay but you may have lost some of them and found them  
24 again when they passed through Point Separation.

25 A Right, I would say that  
26 would be valid, yes.

27 Q And your third one was  
28 to locate and define critical habitat areas for each  
29 species, including areas utilized for spawning, rearing,  
30 feeding, and overwintering. How successful were you



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1 in that?

2 A I would say that we were  
3 not very successful at all for certain areas. We have  
4 been able to locate and define to our satisfaction  
5 numerous nursery areas, a few spawning areas, and a  
6 few overwintering areas; but the overall picture is,  
7 to my opinion anyway, far from being complete.

8 Q All right, and so when  
9 you wrote:  
10 "The movement,  
11 /distribution, population and food habits of  
12 fish in the western coastal Beaufort Sea "  
13 interim report, and stated that spawning habits of a  
14 large number of fish which you studied was poorly known,  
15 that's still the case, is that correct?

16 A I would say that's  
17 correct. I didn't quite get that reference. Did you say  
18 I wrote it?

19 Q I didn't want to be that  
20 particular. I really meant the Beaufort Sea study project  
21 wrote, and it appears to have been written actually  
22 by Galbraith & Fraser; but this was something to which  
23 this panel referred and you are familiar with that  
24 report. are you?

25 A I am not all that familiar  
26 with that particular report, no. That, I believe,  
27 originated from St. Anne de Bellu.

28 Q Now, it contained a  
29 chapter called:

30 "Current state of knowledge,"  
and it went through what will include the major species,





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1  
2 and made the following comments -- and I'll just go  
3 through these species with you. I've done this with  
4 Dr. McCart and I just want to know because you perhaps  
5 have studied these particular species more than he has,  
6 whether you would agree. With regard to least cisco  
7 on page 6 of this report, it says:

8 "That the locations and frequencies of spawning  
9 have not been determined for Mackenzie River  
10 least cisco."

11 That was Mann, 1974, Stein & others, 1973. Is that to  
12 your knowledge still the state?

13 A To my knowledge, yes, it  
14 is.

15 Q And it goes on in the  
16 next paragraph:

17 "Fry hatch in the spring,"  
18 attributing this to Mann, McPhail & Lindsay,  
19 "but unfortunately very little fry hatch in the  
20 spring, but unfortunately very little is known  
21 of their distribution, movements, or feeding  
22 habits."

23 Would you agree that that is still the state of  
24 knowledge with regard to the least cisco?

25 A I didn't quite get all  
26 of that. I would say that the distribution -- now this  
27 is within the Mackenzie system -- the distribution, the  
28 major migratory routes and the food habits I would say  
29 we have a fairly good feel for.

30 Q So that looks like you've





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1  
2 learned something since Mann's report of 1974, and  
3 McPhail & Lindsay's of 1970.

4 A Well, I think even in the  
5 Stein report and in the Jessop & Lilley Report we have  
6 said that, if we can take spawning for an example, I  
7 think I made reference to this yesterday. As I recall,  
8 we still suspect that there is tributaries of the  
9 Arctic Red and the Peel that are suspected spawning  
10 areas, but we don't know beyond that.

11 Q With regard to Arctic  
12 cisco now, the report says at page 7,

13 "The spawning habits of this species are  
14 poorly understood."

15 Would you agree with that?

16 A Yes, I would.

17 Q And it also says:

18 "Although McPhail & Lindsay have reported that  
19 spawning occurs over gravel and fast water  
20 sections of streams, actual periods and loca-  
21 tions of spawnings are not known for Arctic  
22 cisco in the Mackenzie River."

23 Would you agree with that?

24 A Generally I would say yes,  
25 that is my impression.

26 Q On page 8, with regard to  
27 the same species,

28 "Information on the distribution, movements and  
29 feeding habits of fry and juveniles is lacking.  
30 It has been speculated that fry are washed downstream



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to the delta during the spring flood."

Would you agree that that is the hypothesis and that it hasn't advanced beyond that point?

A I would say as a general rule it would probably apply, although through the work of Roger Percy, who was the gentleman who did our Beaufort Sea work, I believe he has located several nursery areas within the delta itself.

Q All right, and he probably then has done that in the past year.

A Yes, within about the past two years.

Q Right, because the references to this particular speculation are Craig & Mann, 1974 and Stein and others, 1973.

With regard to the inconnu, on page 11:

"Little information is available regarding the spawning habits of the inconnu."

Stein and others, 1973. Would you agree that that is true?

A Yes.





1 Q With regard to the  
2 humpback whitefish, page 12:

3 "Little information is available regarding  
4 the spawning habits of this species in the  
5 coastal areas. However, it is believed that  
6 an upstream spawning migration occurs in  
7 mid-autumn."

8 Have we advanced beyond that point?

9 A Generally, I would  
10 say no.

11 Q And those species that  
12 I have just gone through, would you agree that all or  
13 any of them are what you would call major species accord-  
14 ing to the definition you gave me this morning?

15 A I would class them all as  
16 major species.

17 Q And I suggest to you that  
18 they are not only major species, but that some of them  
19 are species upon which the domestic fishery is at least  
20 in part founded?

21 A I would say it would be  
22 closer to being totally dependent, at least within the  
23 delta region.

24 Q Yes. I was leaving out  
25 the fact that people do fish for char domestically  
26 as well.

27 A Now, your fourth -- one  
28 more thing on three. You said that you wanted to locate  
29 and define critical habitat and are you suggesting  
30 in that objective that there may be critical habitats



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for a particular species which has not even been defined?

A You mean here defined  
so far as site specific sites are concerned?

Q Not so much as sites, be-  
cause I believe that you have stated that a lot of  
these sites just are not known. But critical periods,  
would you include, for example, for some species, the  
migratory routes as critical habitat?

A That is a fairly difficult  
question, actually. I think it would depend on the  
individual species and the individual systems that are  
being used. In other words --

Q Yes, I can understand  
that, that some fish may be able to move from stream  
to stream if one isn't available for some reason and  
others may not. Is that what you are trying to suggest  
to me?

A Well, partially, but  
if you take, say, a spawning stream, for instance, for  
Arctic char and consider that the lower reaches of that  
stream, if you want to interpret those as a migratory  
route to that spawning area, then, yes, I would say  
that you could put it as a critical habitat.

Q Your fourth objective  
was to identify areas normally fished domestically and  
to obtain an estimate of the quantities of fish  
taken and how do you feel about your success in reaching  
that objective?

A I think here we were  
partially successful. I think that we have a fairly good





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1 feel for most of the places which are being fished  
2 domestically within the Mackenzie system and in some  
3 instances we have some fairly accurate, I think, esti-  
4 mates on quantities of fish taken. In other areas  
5 it is not as accurate.

6 Q And you based your  
7 research on this on a tagging program, did you?

8 A For identifying domes-  
9 tic fishing areas?

10 Q No, for estimating  
11 catches. How did you estimate the catches?

12 A The catches that were  
13 estimated were actually based ideally on head counts  
14 more or less, the number of people involved in the  
15 fishery, the number of fish that each was taking  
16 at the time, so on and so forth. We did not make use of  
17 the tagging program for that purpose, no.

18 Q How many yaers did you  
19 do this particular head count method?

20 A As I recall it was  
21 about two years.

22 Q Which years were those?

23 A I believe it was '72,  
24 '73.

25 Q Now, when you say  
26 areas normally fished in that objective, how did you  
27 establish which ones are normally fished in a study that  
28 was taken over a two-year period?

29 A Well, I would say as  
30 far as areas normally fished, this would be something



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that we would have been collecting throughout the entire program and it would be a combination of our own observations as to where people had been setting nets, as well as discussions with people in each of the communities that we were working out of.

Q So you did talk to the people to find out --

A Most definitely. That was, I would say where the real emphasis was.

Q Is there any order of importance in the objectives you set out, or do you consider the four of them to be equally important to be achieved?

A I think, sir, I would have a very difficult time trying to choose between objective number one and objective two, because the two are tied very closely together and I think one goes in hand with the other.

Q What about objective number three? Is it equally important with one and two?

A I am sorry, is that not what I said? Number one and number three?

Q I am sorry. I thought you had said one and two.

A If I did I meant to say number one and number three.

Q Yes, and they would be the foremost in importance in your opinion?

A In my opinion, yes, sir.





Stein, Walker  
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Q Now, these four objectives, for what purpose were they headed? Did you feel, for example, that by achieving these four objectives you would be in a position to provide a potential impact assessment<sup>of a gas</sup>/or an oil pipeline across the North Slope of the Yukon and up the Mackenzie Valley?

A If I can clarify that partially before I answer it, it certainly<sup>would</sup>/not be any use to us on the North Slope, being refined strictly to the Mackenzie Valley. I would say that if we had been totally successful on all these objectives that, yes, we probably could have made an impact assessment, although to my way of thinking anyway, the basis<sup>for</sup> collecting the data would be to review the proposal once it was received, if you would wish to call that an impact assessment.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 Q What you were collecting,  
2 I suggest, was what has been called, at least in this  
3 Inquiry, baseline data. Would you agree with that,  
4 various kinds?

5 A As a general description,  
6 yes, I would say it would be baseline data.

7 Q All right, and you conducted  
8 as I understand, no experiments in the sense of, for  
9 example, testing various chemicals and their effects on  
10 fish.

11 A Within our group, no sir,  
12 we did not. Within the institute there were two programs  
13 going on at that time, one within the former research  
14 directorate in which there were sedimentation studies,  
15 toxicity studies and so on.

16 Q All right, and were those  
17 field studies, or were they laboratory studies?

18 A The ones done by the  
19 research people?

20 Q Yes.

21 A They were, to my recollec-  
22 tion I think they were primarily all field studies.

23 Q But that's something that  
24 you personally don't have any knowledge of.

25 A Not that I think I could  
26 relate at this Inquiry with any positive consequence.

27 Q Do you feel that you would  
28 be in a position to assess potential impact of a  
29 pipeline up the Mackenzie Valley from what -- on fish  
30 and other aquatic organisms -- from what you know at





Stein, Walker  
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1 this point about the various species you studied?

2 A To do the type of job  
3 that I feel we certainly should be doing, no, I do not  
4 feel that we are in that position.

5 Q All right. Now in cross-  
6 examination --

7 A Could I elaborate on that  
8 slightly, sir? The testimony that I presented, as  
9 you're aware, included several guidelines and recommen-  
10 dations for borrow removal, stream crossings, and so  
11 forth, and these guidelines and recommendations were  
12 provided on the basis of my thinking/I just related,  
13 that we do have knowledge gaps and primarily in the  
14 area of habitat. I think I could qualify that to the  
15 extent of saying that if these guidelines and recommen-  
16 dations were followed and implemented and were success-  
17 ful, then yes, I think we would be in a situation to  
18 go ahead.

19 Q All right, but you must  
20 do to do that -- you must make the assumptions that  
21 I invited Dr. McCart to make, that the applicant would  
22 be able to do things in the method that they've set out  
23 in their application. That is that the line could be  
24 built the way the engineers have said it can be built,  
25 that mitigative measures that have been outlined are  
26 satisfactory and will be successful,

27 A I don't think I could  
28 agree with that, no. Well, partially you're asking me,  
29 I think, for an engineering judgment but also I believe  
30 a lot of these are proposed but untried.



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1  
2 Q All I'm suggesting to  
3 you is that what you have stated to me is that if we  
4 make the assumptions that the project will be built  
5 as outlined, then you may be able to predict the impact  
6 -- potential impact.

7 A No sir, I don't think we  
8 could without additional habitat data at least.

9 Q All right. Now, following  
10 on from that it appears then, if a problem arises  
11 your part of the Fisheries Department may not even be  
12 able to provide the proper advice for a solution, either  
13 a mitigative solution or a contingency plan solution,  
14 based on the fact that these knowledge gaps exist.

15 A I think in my opinion we  
16 probably could, but if we did it would be on an extremely  
17 conservative basis.

18 Q And when you say you  
19 could, would that involve things like saying, "Look,  
20 you've got to stay out of certain kinds of areas that  
21 we have hypothesized are potential spawning areas, for  
22 example, not that we know they are, but because that's  
23 the kind of river area that these ciscos spawn in."

24 A Yes.

25 Q Were you able to tell in  
26 your studies, whether, with regard to the populations that  
27 you looked at, whether they were in a stable condition,  
28 a condition of decline, or whether they were regenerating  
29 quickly and the population was expanding?

30 A No sir, I would say





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1  
2 generally we were not.

3 Q Did you make the ~~assu~~mption  
4 that what you were dealing with was a normal population?

5 A Yes.

6 Q And that assumption, I  
7 suggest to you, is not necessarily a correct one but  
8 one that you had to make as a starting point.

9 A That's true.

10 Q And following from that,  
11 are you able to say what population variation there.  
12 are likely to be for individual species, either from  
13 year to year or cyclically?

14 A No sir, I don't think we  
15 could.

16 Q So if a population of, say  
17 humpback whitefish, were to decline, during or after  
18 pipeline construction it would be very difficult for  
19 you or anybody else to say whether that were a natural  
20 decline or one that could be attributed to general  
21 pipeline activity, over-fishing, siltation that was  
22 not observed, or to pin it to any particular cause,  
23 unless you actually saw the cause and its immediate  
24 effects.

25 A That's true. If we saw  
26 the cause and the immediate effect, and had the  
27 opportunity to take samples and so on and so forth,  
28 in some circumstances we could, I think, make an assess-  
29 ment of what that ~~cause~~ was. As a general conclusion,  
30 I think you are probably correct; but there's one thing



Stein, Walker  
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1  
2 too, I think maybe should be brought out here, that  
3 a lot of our effort was concentrated on the Mackenzie  
4 main stem itself, including a good portion of our tag-  
5 ging program. So what you have got then is a mass of  
6 fish say coming up through the delta or into the  
7 Mackenzie River, and it is virtually, to my way of think-  
8 ing at least, impossible to define a specific population  
9 within those fish.

10 Q I don't mean to suggest  
11 directed as  
12 that my cross-examination is/a criticism of your  
13 methods or of the level of your studies, I just want  
14 to know where we are.

15 A No, I realize that, sir,  
16 but I thought I should point out some of the difficulties  
17 in actually working, say with what I consider population  
18 dynamics, when it's so difficult to define an actual  
19 population.

20 Q So even given an unlimited  
21 amount of time, that kind of study in the main course  
22 of the Mackenzie might well be impossible.

23 A On the main course in the  
24 Mackenzie, yes.  
25  
26  
27  
28  
29  
30





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 Q Now we have heard from  
2 Dr. McCart that northern fish species are resilient  
3 and from the evidence of Dr. McCart I gather that  
4 what he means by that is that they respond to crises  
5 as populations, that if a certain habitat is denied to them  
6 that they will try and find another one, and Dr.  
7 McCart is shaking his head, so obviously I have  
8 misinterpreted what he said. Why don't you see if you  
9 can define for me what a resilient species is and  
10 tell me whether the species you studied are  
11 resilient species.

12 A Well, I think you  
13 would have to assume that some species are going to be  
14 more resilient than others for a start. It is a  
15 very difficult thing to address without having more  
16 site specific information, really, to relate to, but  
17 the way that I would look at it is that if you have two  
18 streams, for instance, side by side, and the total  
19 say, spawning habitat within that stream is destroyed,  
20 I don't think that you can make the assumption that  
21 they are immediately going to move to the second  
22 tributary when that -- if there is any suitable  
23 spawning habitat in that second stream, it is probably  
24 already being used by other fish.

25 Q Would you say that they  
26 are able to withstand losses of an entire year class  
27 and still have the populations survive?

28 A I would say as a general  
29 rule, yes, / that a year class could be lost without the  
30 population being lost.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 Q All right.

2 A Now, I am not saying  
3 that the population isn't going to change.

4 Q Yes. Now, I gather that  
5 is in the natural state, that is, without pressures  
6 from commercial or domestic fishing, or perhaps  
7 increased pressures from siltation from roads or  
8 possible siltation from pipeline related activities?

9 A Well, you are potentially  
10 talking about the loss of more than one year class.

11 Q I realize that, but if a  
12 natural phenomenon, such as the freezing of an over-  
13 wintering spot for juveniles who haven't gone to  
14 sea yet, for example, wipes out that particular portion  
15 of the population, that is something which the  
16 species, if it is resilient, the population can  
17 come back?

18 A It could come back, yes.

19 Q Now, if you add that to a  
20 number of manmade disturbances, would that increase your  
21 concern?

22 A It would certainly  
23 increase my concern, yes.

24 Q And in your opinion,  
25 could a population of any one of the species that you  
26 are familiar with be pushed by this kind of pressure,  
27 manmade plus natural, to a point where it might never  
28 recover?

29 A Well, this is something  
really that; I think as I pointed out in my testimony,



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

that nobody has really looked at. There are numerous potential impacts that, both natural and manmade, for that matter, that could hit any given population.

Now, what the additive effect of all these individual impacts are going to be on an individual population, I don't really, in my opinion, I don't think that anyone knows.

In that situation -- now, did you make a reference to a population or a species?

Q I am talking about a population because I assume if you lost a population of Arctic char, for example, in the Big Fish River, that that doesn't mean that the Arctic char in the Canning River are jeopardized.

A That is true. Okay. Looking at, let's say, relatively extreme conditions, and I am talking about these additive effects now, I would say yes, an entire population could potentially be lost, most definitely.

Q And that might not be something that is of any particular importance to the survival of the species?

A It may not be, no, depending again on the number of individuals of that species that are available within the system.

Q It may nonetheless be important to other, both animals and men that feed on the particular population that stands a chance of being lost?

A That is very true, yes.





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 Q Now, I think that we  
2 have identified certain knowledge gaps related to  
3 habitat. Are there any other knowledge gaps in your  
4 studies that you feel should be filled before you would  
5 be happy about making an environmental impact assessment  
6 for a  
/project like the proposed pipeline?

7 A Where did you want me  
8 to start?

9 Q Wherever you like.

10 A Well, to take two right  
11 off the top I would say that I would like to see some  
12 additional work done on sedimentation and its effect;  
13 and the other major one I would think would be in  
14 toxicity. I made reference to that, I think, in the  
15 testimony, the type of work I think that should be  
16 done. I think the important thing is, in a lot of this  
17 work, is that it start being related a little bit more  
18 specifically to A) Northern species; B) Northern  
19 organisms, for that matter; and C) the Northern  
20 environment. Does that answer your question?

21 Q Yes, are there any  
22 others that you can -- any other gaps that you think  
23 should be filled before --?

24 A Well, if I had a little  
25 more time to think on that one I probably could come  
26 up with a list of these --

27 Q Well, why don't you take  
28 the time to think and I will go on to other things and  
29 perhaps either after coffee or later on in the day you  
30 may want to say something about that.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 THE COMMISSIONER: Before  
2 we go on, Mr. Stein, you and your colleagues on the  
3 panel, I think all of you suggested certain things that  
4 had to be studied and so on and you have just now  
5 repeated three areas of concern.

6 Are you saying that these  
7 studies, I don't mean the studies relating to monitoring  
8 of the impact of a pipeline once construction is  
9 underway and once the pipeline is in the ground and  
10 running, but you have all indicated that there are  
11 some studies that you think should be carried out  
12 before the pipeline is built.

13 Now, have you any idea how  
14 long it would take to carry out these studies? For  
15 instance, along the Mackenzie River you have indicated  
16 our knowledge of fish populations is incomplete. How  
17 long do you think it would take to do the studies that  
18 ought to be done, in your opinion, and we are only  
19 asking you for your opinion, before construction of  
20 the pipeline got underway, assuming that it is going  
21 to be built and of course that is something that we  
22 are told hasn't been determined.

23 A You would like a time  
24 frame, I take it, for, to include, say, all of these  
25 studies that I have just given you, is that correct?

26 Q Yes, because you and  
27 your colleagues on the panel have indicated that there  
28 are some studies, some data that ought to be collected,  
29 some studies that ought to be carried out and I got  
30 the -- certainly the implication appeared to be that





Stein, Walker  
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Cross-Exam by Bayly

much of this work should be done before you built the pipeline, assuming it is going to be built. Now, how much, you know, we are almost to the end of the year, so, how long from January 1st, 1976 would it take to get the information that you -- to carry out the studies that you feel we should have before a pipeline construction begins? Have you any idea, any rough idea?

A I would give you my opinion, yes, sir, and I would say probably something in the neighbourhood of two to three years, given the appropriate level for funding and manpower that are needed. There is one area here that I could say that would be particularly time consuming and that is in overwintering habitats. Now, I think we all have very good data on those habitats that are overwintering habitats, that are readily visible. and that is aufeis areas and open water areas. I am not convinced in my own mind that this is by any means the complete list, and I am sure that you could probably imagine in your own mind, especially on a day like today, what it would be like to have to sample, say, for a given stretch below a stream crossing to determine just what sort of habitats you have and whether indeed the fish are using them. But to my way of thinking at least, this could potentially be a very critical area and it is one that is going to be very difficult to put a handle on and it is going to take time if it is done right.



Stein, Walker  
Steigenberger, Millen  
In Chief

1 THE COMMISSIONER: Yes, thank  
2 you. I wonder if you, Mr. Walker and Mr. Steigenberger  
3 and Mr. Millen might just think about that same question  
4 and later on today you could let me have your thoughts  
5 on it?

6 Well, we'll adjourn for coffee  
7 now.

8 (PROCEEDINGS ADJOURNED FOR A FEW MINUTES)

9 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

10 MR. ANTHONY: Mr. Commissioner,  
11 before Mr. Bayly commences his -- or re-commences his  
12 cross-examination, you asked Mr. Stein prior to coffee,  
13 an indication of such subjects that he feels should  
14 be studied prior to construction, an idea of the  
15 timing, and I believe he now has a few other areas he  
16 would like to suggest to you, and then I suggest that  
17 perhaps the other members of the panel add their  
18 items to the list now, in the event that other people  
19 wish to comment.

DIRECT EXAMINATION BY MR. ANTHONY (CONTINUED):

20 Q Perhaps, Mr. Stein, you could  
21 respond to the question to start with.

22 WITNESS STEIN: Mr. Commissioner,  
23 I should point out obviously that this was done very  
24 rapidly and I'm sure it's far from being a complete  
25 list. But it's a few examples of the type of work I  
26 think should be going on before construction. There  
27 are three that I've already outlined, one being work  
28 on habitat assessments, especially under winter condi-  
29 tions., toxicity studies on Arctic organisms in  
30 Arctic environments, similarly sedimentation studies on



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In Chief

1  
2 Arctic organisms and I think this should be done  
3 probably in typical stream types within the project  
4 area. Studies on loading and duration of sediment  
5 impacts --

6 Q Excuse me, Mr. Stein,  
7 could you go a little more slowly, please?

8 THE COMMISSIONER: Maybe you  
9 could start again just so that counsel could get these  
10 down.

11 A Right. The first three  
12 that I made mention of in my examination just prior  
13 to this were, studies on habitat or habitat assessments;  
14 the second one I had referred to was toxicity studies  
15 on Arctic organisms, Arctic aquatic organisms and in  
16 the Arctic environment; the third one was sedimentation  
17 studies, again on Arctic organisms, aquatic organisms,  
18 and preferably in typical stream types within the project  
19 area; the third one was studies of sediment loading and  
20 the duration of sediment impacts; the fourth one might  
21 be studies of the responses of fish to trench dredging  
22 and I refer here to both the physical operation of the  
23 dredge and the resulting sediment load; a fifth one might  
24 be studies of how stream crossing berms are likely to  
25 affect stream flows and the effects these changes will  
26 have on fish movements and stream stability; and the last  
27 one I had a chance to note here would be site specific  
28 studies on potential water sources and the effects that  
29 this use will have on the resource and habitat avail-  
30 ability.





Stein, Walker  
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Q So that it's clear,  
Mr. Stein, in your answer here to questions you gave  
a figure of a two to three-year study period to study  
the factors that you don't find earlier, would you  
stick with that time frame reference if you include  
these other studies?

A I think in my opinion  
yes, it would still be a reasonable time frame.

Q I wonder if perhaps any  
of the other panel may comment, if they have anything  
to add to that list? Mr. Walker?

WITNESS WALKER: With refer-  
ence to the question of time frame, two or three years  
seems a reasonable time providing we have the alignment  
and the resources to carry out the work, the resources  
in terms of manpower and funds.

I would pass my comments on  
knowledge gaps to Steigenberger.

Q I see.

WITNESS STEIGENBERGER: Thank  
you. I'd just like to add two things to Jeff's  
comments. I'd like to clarify a point for me anyway,  
it's specific to that area within the two routes within  
the Northern Yukon Territory, because I haven't been  
involved in the Mackenzie Delta, and if I asked myself  
the question, you know, "Do we have enough information  
to protect aquatic resources in the northern part of  
the Yukon?" With some species I'd probably say, "Yes,"  
and this would apply to Arctic char and grayling on  
the prime route, and it would apply to chum salmon and



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1  
2 chinook salmon on the interior route. With regard to  
3 white fish on the interior route I'd say probably not.  
4 I'm aware of some information on least cisco and  
5 Arctic cisco that Dr. McCart has done on the North  
6 Slope and I haven't had time to fully evaluate that,  
7 so I'm hopeful that that information is adequate at  
8 this time. I'd say that it was adequate, you know, up  
9 to a point where we could make some judgment as to  
10 the route selection, you know, which of the ways we're  
11 going to go, and hopefully that studies, once this has  
12 been decided, can be more site specific.

13 One thing that comes to mind  
14 relative to the site specific stuff, has come out of  
15 information from the Beaufort Sea program that are  
16 by way of personal communications. During the Beaufort  
17 Sea study, juvenile Arctic char were found in very  
18 small tributaries close to the Beaufort Sea, and these  
19 appeared to be close to or synonymous with small ground  
20 ice or aufeis areas in very close proximity to the  
21 coast, and we really don't know enough information about  
22 these areas on how they contribute to spawning and/or  
23 overwintering fish populations.

24 The other thing that I might  
25 direct some attention to is winter biology within the  
26 Northern Yukon again, and again this -- I would say that  
27 we have in some cases good information on the documented  
28 areas, and this is a good starting base, again until  
29 route selection has been selected. I hope that once a  
30 route has been selected then we could get into specified









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1 Then away from site specific  
4 crossing sites I would like to see more work on wharfing  
3 and staging areas, and some of the borrow sources that  
4 are not on the alignment sheets, in close proximity to  
5 the pipeline right-of-way, and so they come to light  
6 after you have published the material or you weren't  
7 aware of it at the time, where we considered there was  
8 no problem on the Walking River as an example at  
9 the crossing site because we didn't know that there  
10 was a borrow source down near the estuary, so hopefully  
11 these things can be investigated sometime in the  
12 future.

13 I think that that is adequate.  
14 It is more site specific for my area of study. I  
15 will pass the mike to John Millen now.

16 THE COMMISSIONER: Well, just  
17 before you do, Mr. Steigenberger, what is your  
18 estimate of the length of time that would be necessary  
19 to carry out the studies that you feel should be  
20 done before the pipeline is built?

21 A Well, at the present  
22 time -- I want to give you some background. We haven't  
23 been funded in our region since the 31st of March, 1975,  
24 so at the present time we are falling behind in collecting  
25 research data, and even getting in the realms of  
26 questionability about qualifying or inspecting other  
27 people's research. So I would think that a time  
28 frame, you know, of one to three years, provided that  
29 it is top priority given some permanent man years in-  
30 stead of casually people and secondments that go by the



Stein, Walker  
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1 wayside.

2 Q You are in the northern  
3 Yukon. You are telling me about the program relating  
4 to the northern Yukon only?

5 A Pardon me? Just that  
6 area within the northern Yukon because I feel that  
7 we got site specific a little earlier than the  
8 Mackenzie Delta and it is a little smaller area to  
9 study, so I think we would be able to put a better  
10 handle on it.

11 Q Well, suppose that you  
12 didn't get the money and manpower that you need to  
13 complete the studies and that the current level of  
14 funding, the same priority that you have now were  
15 to continue, what would be the length of time that  
16 you would need?

17 A Well, we aren't  
18 continuing any studies, sir --

19 Q I see.

20 A So that no further assess-  
21 ment is being carried out by the Pacific Region within  
22 the northern Yukon --

23 Q I see, so nothing at all  
24 is being done then?

25 A Absolutely nothing.  
26 It was terminated on the 31st of March 1975 when the  
27 Environmental-Social Committee was defunct, --

28 Q Was wrapped up --

29 WITNESS WALKER: With one  
30 exception, the numeration of the fishing chum





Stein, Walker  
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1 salmon in the fishing branch in 1975, in which case we  
utilized regular funds to carry out that innumeration.

3 Q But at any rate, if you  
4 got the money and manpower you say one to three years  
5 to complete the work on the north coast that you  
6 think should be done?

7 WITNESS STEIGENBERGER: Yes,  
8 I think -- but you know, I think those studies have  
9 to be more site specific to the specific routes that  
10 are chosen within our study area. I am not too sure  
11 that we have to go out and do more regional general  
12 biology without collecting data that is more related  
13 to the specific development under consideration.

14 THE COMMISSIONER: Right.

15 MR. ANTHONY: Mr. Millen, would  
16 you like to comment?

17 WITNESS MILLEN: Yes, there  
18 are two areas that I think could be added to that  
19 list for a fully satisfactory assessment and design  
20 of the pipeline. The first that I would propose is more  
21 information on the effectiveness of proposed erosion  
22 control techniques that have been --

23 THE COMMISSIONER: Excuse me,  
24 the effectiveness of what?

25 A Of the erosion control  
26 techniques that have been indicated by the applicant  
27 will be used, particularly those that apply to the  
28 slopes that will result<sup>when</sup> excavations are made on  
29 the approaches to stream crossings. If the techniques  
30 are successful, 100% successful, I think it could be



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1 demonstrated in two years, otherwise, of course, it would  
2 take longer.

3 The other area that I would  
4 suggest is further information on the proposed tech-  
5 niques for passing subsurface flows past the ice bulb  
6 which is anticipated to form around a chilled pipeline  
7 in some stream crossings. I am not sure that a full-  
8 scale demonstration of that is required, but I suspect  
9 that further field investigations of conditions under  
10 the streams and some further theoretical calculations  
11 may be sufficient to demonstrate this and it may be ought  
12 to be done in one or two winters.

13 THE COMMISSIONER: You said  
14 one or two years?

15 A Yes, that is correct.  
16 CROSS-EXAMINATION BY MR. BAYLY (CONTINUED):

17 Q Now, as I understand  
18 then, the estimates that you have all made, and I gather  
19 that they are all contingent on receiving funding and  
20 adequate manpower, but assuming that that were there,  
21 that it would take between one and three years to  
22 complete studies on those things that you would feel  
23 would be important and in some cases necessary to be  
24 able to adequately assess the potential impacts and  
25 to recommend to an applicant for a pipeline right-of-  
26 way, areas that should be avoided, or special measures  
27 that should be taken, would you all agree with that?

28 THE COMMISSIONER: That is  
29 what I understood the panel was saying.

30 MR. BAYLY: Yes.

Q Now, Mr. Stein, with





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1 regard to the fish that you study in the Mackenzie, as  
2 I understand a lot of them go in the summer time out  
3 into the Beaufort Sea and use the coastal lagoons and  
4 the area along the Tuk Peninsula.

5 Now, I gather from the way the  
6 jurisdictions are divided, that the fish cross over into  
7 the region that is the responsibility of the people  
8 from Vancouver when they leave the mouth of the delta,  
9 is that correct, or do you follow the fish that you are  
10 interested in, say, along the coast of the Yukon?

11 WITNESS STEIN: If I can  
12 partially clarify that. I think what you are saying  
13 is that it is actually, say, the winter-spring period  
14 when they are probably in that area moving upstream or  
15 feeding in the delta during the summer --

16 Q Yes.

17 A We have no boundaries  
18 as far as following fish if we think that there is a  
19 likelihood that they are going. As I recall, in our  
20 Beaufort Sea work our most westerly point was Shingle  
21 Point which is in the Yukon Territory. Beyond that it  
22 is not a question of jurisdiction, it is a question  
23 of logistics and we would rely then most heavily on  
24 the people working in the Yukon itself.

25 Q I see, but these studies  
26 might be then divided among people because of the  
27 logistics of getting them to the areas of where the  
28 fish might be at different times of the year?

29 A Right.

30 Q And although it isn't an



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1 area of your study, and perhaps Dr. Steigenberger could  
2 have a look at this, are you satisfied with the amount  
3 of research that has been done on the importance of the  
4 coastal lagoons, the interdependence of the fish from  
5 the Mackenzie that use those areas in the summertime?

6 WITNESS STEIGENBERGER: I  
7 would say not entirely. I think Dr. McCart has pointed  
8 out, through communications, that migrations of the  
9 fish can either be from northwestern Alaska and/or  
10 from the Mackenzie Valley and if we look at the numbers,  
11 abundances of the fishes and where exactly these fish  
12 are coming from and how these coastal lagoons contribute  
13 to productivity of fish; I think there still is the,  
14 you know, some degree of uncertainty and again, this  
15 is part of a watershed concept that is downstream of a  
16 corridor that can be affected and it requires further  
17 study. I am not too sure how much it should be, but--

18 Q Perhaps I could venture  
19 a question that I got into trouble with with Dr.  
20 McCart, and that is one of definition on significant  
21 populations. I note that the term has been used, I  
22 believe in the evidence of you, Mr. Stein.

23 WITNESS STEIN: I will give  
24 you my definition of significant populations, yes.  
25 It is based in our thinking on two things. One is  
26 again the relative abundance of that species within  
27 a given area. If we were to, say, take three or  
28 four different streams and there was a dozen fish in  
29 one and two dozen in the other and a hundred in the  
30 other, then we would say that the third would be the



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most significant population of the three.

The second part of that  
definition is the dependence of any sport, commercial  
or domestic fisheries on that population.





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Q When I was cross-examining Dr. McCart and we were talking about populations, I asked at page 13927 of the transcript and onto the next page a question about causes of drops in population and population sizes. In answer to that question, and it's a long one so I'm just paraphrasing it, the answer is:

"I would say that one of -- it's much more important to know something about population size than to know what the food habits happen to be."

Now given that this may vary from species to species, would you agree with that, or is it as important or more important to know what food habits are than population sizes?

MR. MARSHALL: Mr. Commissioner, it seems to me that Mr. Bayly is trying to expedite matters by summarizing the statement. It's really a much more complex question indicated, and I don't know how the witness can do justice to the summation or indeed to Dr. McCart's comments.

MR. BAYLY: I was trying to be fair to Dr. McCart, Mr. Commissioner, because I asked a question that had nothing to do with the answer, and -- but I will read the question and then Dr. McCart makes the statement which is called an answer. I'll read the question.

"I'm just coming in at the back door then of what you answered to Mr. Bell, that if you were the man sitting to try to determine the cause of a drop in population, you would have a difficulty



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1 -- a difficult time because of these types  
2 of problems, and those types of problems go  
3 back to a statement in answer to another question,  
4 'I think it's a very complicated subject and  
5 I'm not sure that a lot of food habit studies  
6 are very informative.'"

7 The answer then to the question I asked was,

8 "I would say that one of - it's much more import-  
9 ant to know something about population size than  
10 to know what the food habits happen to be."

11 Does that help you, Mr. Marshall?

12 THE COMMISSIONER: Well, that's  
13 the excerpt. I think you should address the witness  
14 now, we'll just take it from there.

15 MR. BAYLY: Yes.

16 Q Just given that as a ques-  
17 tion to you, and would you agree with me that population  
18 size is more important to know about, than food habits  
19 with regard to the species of fish that you have  
20 studied?

21 A In the Mackenzie region  
22 I would definitely say "No, it is not more important."

23 Q All right. Would you rank  
24 them in importance, or would you feel that they are  
25 equally important?

26 A I don't think that -- no,  
27 I wouldn't want to rank them. Let me go at it in  
28 this way. We did not attempt, as I mentioned previously,  
29 to come up with specific population estimates with one  
30 or two exceptions which we dealt with yesterday, I





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1 believe. Part of that reason, as I also mentioned,  
2 is due to the fact that you have these tremendous  
3 number of fish stocks and combined populations coming  
4 up the Mackenzie and the difficulty in breaking them  
5 into individual populations. I think I would argue  
6 that the value of food habit studies is quite high and  
7 that if you take sedimentation as an example, most  
8 free-swimming fish, if given the opportunity, and if  
9 conditions are such that they must, they will leave  
10 the area. This is not true of invertebrate and  
11 benthic organisms, that may be a little qualifying, but  
12 it is these organisms that are going to feel the  
13 initial impact. They are either going to be wiped  
14 out as such, in other words smothered, or are going  
15 to have to lose their hold on the bottom and drift  
16 out of the area. It is these organisms that  
17 by far the majority of juvenile fish are heavily  
18 dependent upon, as well as many of the adult fish,  
19 depending on species. So I would say that food habits  
20 will be -- is an important aspect.

21 Q Thank you. There's another  
22 statement here by Dr. McCart that I'd ask you to comment  
23 on, and I would request that if anybody else on the  
24 panel feels that they have something to add to this,  
25 it may not be a question just for Mr. Stein.

26 The question was with regard  
27 to food at page 13926:

28 "All right, well let's get more specific then.  
29 Is the state of knowledge on what they actually  
30 feed on in the Mackenzie Delta area and North



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1 Slope either east or west of the Mackenzie  
2 and the rivers they inhabit when they have  
3 completed or during their migrations, have  
4 these been studied to any extent which would  
5 tell us what they feed on and depend on?"

6 Answer:

7 "Well, you see, the difficulty with food habit  
8 studies in fishes is that you find that the  
9 fish eat whatever is available to them. All of  
10 these Arctic species are very resilient. If  
11 there are no mollusks to be eaten, they'll eat  
12 anthropods, and if there are neither of these,  
13 they'll eat plankton, and if there are neither  
14 of these they'll eat surface insects. So I'm  
15 not too concerned about the fact that we don't  
16 know what they happen to eat in any particular  
17 circumstances because they are going to eat  
18 whatever is available to them."

19 In the studies that you have done and perhaps studies  
20 that you have done, Mr. Steigenberger, is this your  
21 experience?

22 WITNESS STEIGENBERGER: I would  
23 say that it's partially correct. I'm referring now  
24 specifically to the delta and the Mackenzie system.  
25 We have found that when you look at a species, say  
26 throughout the Mackenzie system, there are variations  
27 in their feeding habits. In other words, a white fish  
28 in the delta may be feeding on an entirely different  
29 organism than will be a white fish in the Fort Simpson  
30 area.



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1  
2 Q Are they selective though,  
3 if there are a number of things available to them?

4 A In certain circumstances  
5 yes, they appear to be. Inconnu, for instance, in the  
6 delta, I believe in the Beaufort Sea study they were  
7 found to be gorging themselves on Arctic lamprey.  
8 Quite frequently you will find that they are being  
9 very specific on the organism that they are feeding on.  
10 I don't know if I could really go on beyond that and  
11 say what the impact would be if indeed they lost that  
12 particular species, whether they would be that willing  
13 to change over, or that capable of changing over.

14 Q Would you say then that  
15 it may be not entirely understood why they feed on one  
16 thing in one place and then later on, or in a different  
17 geographical area will be feeding on something else?

18 A Yes, I would say that  
19 partially, I suspect, it would be a matter of abundance  
20 of that particular organism, but no, I don't think it  
21 is entirely understood.

22 Q Are there any other  
23 comments from the panel on that?

24 MR. ANTHONY: I believe Mr.  
25 Walker would like to address that.

26 WITNESS WALKER: There is  
27 some selectivity in the intake of food. I can't give  
28 you a specific example for the North Yukon, but in the  
29 South Yukon where we have the same kinds of species  
30 we have found in Asiatic for example, in noting -- in





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1  
2 stream drift-- in noting just what the composition of  
3 that drift is, that the grayling will utilize the  
4 most common species which happens to be black flies or  
5 the snow simuleti whereas the white fish will  
6 take bottom organisms to a larger degree. Also we have  
7 noticed that within the white fish itself, considerable  
8 differences within a distance of one kilometer at the  
9 same time of year. The white fish at the outlet of  
10 the lake will be eating plankton, whereas further  
11 down the stream the white fish will be consuming eggs,  
12 presumably from a spawning population upstream.

13 Still further downstream  
14 and this is downstream of a small pond, they'll be eating  
15 catisfly  
16 larvae and this is the same kind of fish at the same  
17 time of year. Selectively taking -- now, we don't know  
18 exactly what the availability of the food may be,  
19 how much selective action is really going on at this  
20 time.

21 Q All right.

22 A But we are studying this,  
23 we are studying food because the quality and the quantity  
24 of the stream drift and bottom organisms may change  
25 with development, and so we're looking at the spectrum  
26 of food that is taken in by the different species.

27 Q So in one sense Dr. McCart  
28 is right, that they do eat a large number of things, but

29 A Yes.

30 Q -- the reasons why may not



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1  
2 clearly understood.

3 A That's right. They appear  
4 to be opportunists.

5 MR. ANTHONY: I believe Mr.  
6 Steigenberger also wishes to make a comment.

7 WITNESS STEIGENBERGER: Mr.  
8 Walker just used the term "opportunistic" and I think  
9 that's a term that Dr. McCart was using and it applies  
10 to certain species of fish. I'd like to just add a  
11 comment and consider what they call the piscivorous  
12 types of fish or those types of fish that eat other  
13 fish.

14 THE COMMISSIONER: What was  
15 that technical word you used?

16 A Piscivorous , those  
17 fish that act as predators on other fish. I'd just like  
18 to point out that there can be a definite difference  
19 in the interior and on the northern route. For example,  
20 in the interior route the pike, the inconnu, and the  
21 berbot primarily feed on chub, suckers and small  
22 berbot, lamprey, and if you disrupt the abundance of  
23 these smaller fish organisms the chain of inter-depend-  
24 ence and the ecological balance can be upset and you  
25 can change the dynamic actions of the population.  
26  
27  
28  
29  
30





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On the prime route on the North Slope, the only piscivorous species that I have dealt with are predators of pike and I noted that they fed both on other fish and in one lake they fed on gammarus or these small anthropods. I am not too sure whether that is a general rule or whether it was just an exception in that there was a superabundance of these anthropods in the system.

Q Now, another matter that you may be able to comment on, Mr. Steigenberger, and I will be referring to Volume 92 of the transcript, page 14035. In an answer to a question that I asked Dr. McCart, question:

"And what I am getting at is you have in many areas fairly detailed local knowledge of the particular water body and what is to be affected, and where the population is that may be impacted, and in using this knowledge I want to know if you can assist me, I want to know the criteria you bring to bear on the subject."

Answer:

"What criteria I would use in determining whether it was an area that was especially deserving a protection?"

Question:

"Yes."

Answer:

"The presence of fish."

Now, reading your evidence, Mr. Steigenberger, at page



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1 16, the second paragraph on the page, you talk about  
2 in your recommendation that all documented and potential  
3 overwintering, and/or spawning areas in close proximity  
4 to the proposed crossing sites capable of supporting  
5 one or more life stages of fisheries resource and  
6 probable spawning sites be designated as of particular  
7 importance (critical) and protected as such.

8 Have you found that reference,  
9 sir?

10 A Yes.

11 Q Are you referring there  
12 to areas where the presence of fish may not have  
13 been determined?

14 A In some instances, yes.

15 Q If we referred as an  
16 example to the Malcolm River, where I understand from  
17 Dr. McCart's evidence that people have been looking  
18 for fish, for char, but have not been successful in  
19 the years that the studies have been carried on, of  
20 finding them, would you agree that it is that kind  
21 of area that you are talking about as potential areas  
22 for fish?

23 A I would say yes to that  
24 question and I would qualify it from an excerpt from  
25 volume 16 written by Dr. McCart and where he says that  
26 in the Malcolm River, possible overwintering downstream  
27 of the crossing and in Fish Creek, which is downstream  
28 of the crossing he said, may be overwintering downstream  
29 of the crossing. I am just asking that these areas  
30 be set aside and protected and this is a recommendation



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1 on the conservative side.

2 Q It may be that they will  
3 never use them, but they may well be ones that could  
4 be used, sites that could be used.

5 MR. MARSHALL: I think, Mr.  
6 Commissioner, there was evidence given by Dr. McCart  
7 on these areas and he testified that they have found  
8 fish in them and measures will be taken to avoid  
9 them.

10 MR. BAYLY: Now, one of the  
11 things that Dr. McCart brought out in his evidence and  
12 I don't have a reference at hand at the moment, but  
13 that fish aren't always found in the same streams.  
14 That is, his tagging program showed that sometimes  
15 fish that appeared in one stream at another time appeared  
16 in another stream, and I believe he was referring  
17 specifically to Arctic char in that piece of evidence.  
18 Would you agree with that as being a phenomenon that  
19 occurs on the North Slope of the Yukon and in  
20 Alaska?

21 A From discussions with  
22 Dr. McCart I am aware of that happening. The one thing  
23 that he did point out to me was the fact that they  
24 possibly overwinter in different streams. They have  
25 homing and probably site specific spawning areas. I  
26 may be wrong on that, and I may have taken him out of  
27 context, but you might ask him if that is a correct  
28 interpretation.

29 Q All right, I don't see  
30 him shaking his head this time.





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1 MR. MARSHALL: Dr. McCart has  
2 a paper on that subject. It can be made available.

3 MR. BAYLY: So to say that  
4 an individual stream has its own individual population  
5 may not be entirely correct, although they may come  
6 back to the same stream to spawn. There may be some  
7 overwintering that goes on in different streams by the  
8 same fish?

9 A I think you are taking  
10 the word "population" out of context. Are you using  
11 it in reference to overwintering, or are you using it  
12 in reference to spawning?

13 Q Well, that is what I am  
14 asking you because there is in the evidence of one  
15 member of this panel a statement that each stream  
16 has its individual populations and -- I believe that  
17 was Mr. Walker, I am not sure -- and as I understand  
18 it from Dr. McCart's evidence and now from his paper,  
19 that this isn't entirely so in the sense that they  
20 don't just home to the same stream.

21 A Well, just hang on -- I  
22 haven't read this specific paper and Mr. Walker  
23 wants to comment on this topic.

24 Q All right. Perhaps Mr.  
25 Walker can comment on it and I will try and find it  
26 while you are commenting, Mr. Walker.

27 WITNESS WALKER: When I made  
28 reference to --

29 Q It is on page six of your  
30 evidence, and in fact, you didn't say populations, you



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1 said each with its own race. The second paragraph.

2 A Yes, I was using that in  
3 the context of spawning principally, that the fish  
4 home to the place of their birth and they utilize a  
5 common environment and participate in a common gene  
6 pool and by doing this they reproduce themselves. But  
7 they are specific at that particular time, at that  
8 reproduction stage. Now, the fish go through a number  
9 of life stages. Following spawning there is spawn  
10 incubation and hatching, fry emergence, nursing,  
11 feeding and then later in life, of course, maturity and  
12 then they spawn.

13 Now, these different  
14 life stages may be carried out at places other  
15 than where they spawn.

16 Q Now, is it documented  
17 that they actually spawn in the same places, have you  
18 done marking or tagging studies that substantiate that,  
19 or is that a theoretical statement?

20 A This home stream theory  
21 or racial concept has been very well developed in the  
22 Pacific salmon, as you probably know. That is the  
23 basis of regulation.

24 THE COMMISSIONER: What did  
25 you call it? The home stream theory?

26 A I referred to it as  
27 the home stream theory.  
28 This is where you utilize the stock on their return  
29 to the home stream and you identify a species returning  
30 to a particular stream. You break it down into a  
number of genetic units and you try to regulate them





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1 according to this genetic composition. Perhaps it is  
2 best explained if you picture a stream in your mind,  
3 just a stream that is not too complicated, and there  
4 is a particular group of fish spawning in this stream  
5 and it has a rather common environment, particularly  
6 in terms of temperature, kind of a uniform environment,  
7 and you will see a stock of fish returning to that  
8 particular place year after year; and now if you take  
9 that stream and say it flows into a lake, and that  
10 lake drains to a system, well, now you have in the  
11 simplest terms, three different kinds of environment,  
12 like you have a stream coming into a lake, you have  
13 a lake environment, then you have a stream below a lake  
14 and of course the lake acts as a reservoir and has  
15 warmer temperatures and so the stream below the lake  
16 is quite different than the stream above the lake.

17 Well, here in the stream  
18 below the lake you have another, within the same  
19 species, another kind of fish, I mean a species of  
20 fish with different characteristics in performance  
21 and tolerances to temperature and swimming abilities  
22 and this sort of thing. So you have this complexity,  
23 and you can multiply that a thousand times, or ten  
24 thousand. So to get back to the original point, was  
25 that for specific, for the spawning act at least,  
26 we identified these particular genetic units homing to the  
27 same place at the same time of year generally, year  
28 after year. But other parts of the life history  
29 may be carried out outside of that particular area,  
30 nursing, feeding, etc.



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1 Q Now, Mr. Walker, would  
2 this make, would you agree with Dr. McCart that this  
3 would make stocking or restocking of a population of  
4 Arctic char on the North Slope very difficult, or that  
5 the success rate might be very low?

6 A It is difficult to  
7 predict the success of stocking, even with species  
8 of which we have considerable experience; rainbow  
9 trout and salmon. We still have many failures, and  
10 it is in large part a trial and error technique.

11 Q It is not something that  
12 you would want to rely on in the event that some  
13 development caused a local population to be decimated?

14 A Not entirely, but  
15 science is developing techniques whereby we are beginning  
16 to better understand how to stock. For example, they  
17 have stocked grayling on the Kenai Peninsula in  
18 Alaska where grayling did not exist before and they  
19 have a self-sustaining population which is utilized in  
20 the sport fishery, so -- and we can cite many examples  
21 of salmon and trout, successes and unsuccesses.

22 For Arctic char, in order to  
23 be successful I imagine you would have to more clearly  
24 understand the life history of the char and the kinds  
25 of habitats and conditions under which various life  
26 stages are dependent on for success. For example,  
27 the fry, just what is required to bring them through  
28 the first year, and the fingerling and the other  
29 juvenile stages. So, it could probably, eventually, it  
30 may be done.



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1 Q At this stage the knowledge  
2 gaps are significantly large that you feel that you  
3 couldn't predict with any success or failure rate of  
4 that kind of a project.

5 A At this time I'd say it  
6 would be risky to attempt transplants of Arctic char  
7 and have it succeed.

8 Q Have you done studies that  
9 would indicate the possible impacts of crossing the  
10 mouth of the Mackenzie Delta with the pipeline and the  
11 new alignment of the prime route that has been proposed  
12 by the applicant? Would that be you, Mr. Stein?

13 WITNESS STEIN: Yes sir, I  
14 believe it would. We have not done specific studies  
15 related to impact at that site. That, I think, was your  
16 question. If I can elaborate slightly, I would say that  
17 again, I think I can go so far as to say that pretty  
18 each and every one of the recommendations and guidelines  
19 that I pointed out in my testimony would apply in the  
20 delta, if not more so. There is one particular  
21 crossing -- maybe I can just throw this out now -- that  
22 I am a little bit more concerned about, and that is  
23 the crossing of Shallow Bay. I believe it is in the  
24 testimony before this Commission that it will be a summer  
25 crossing and it is intended to avoid the calving  
26 period for beluga whale, which I think was quoted as  
27 late June-July. Now if this is indeed done, and it is  
28 still planned and constructed as a summer crossing, then  
29 I think it's inevitable that this construction is going  
30 to be going on at the time when these major fish





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1  
2 migrations are going to be occurring in the west  
3 channel, which means that they have to have access  
4 through Shallow Bay itself. This is, I say, of  
5 some concern to me and I can only ask questions right  
6 at this time on this, if I can proceed that way.

7 I would really like to know,  
8 a part of this came out in this list of other studies,  
9 but we don't know now what the reaction of these  
10 migrations is going to be, to a dredge operating across  
11 Shallow Bay, if it is dredged.

12 THE COMMISSIONER: Excuse me,  
13 Mr. Stein. You mentioned the beluga whale calving in  
14 Shallow Bay in June-July. What other fish have you  
15 in mind when you state your concerns? You said fish  
16 spawning in Shallow Bay.

17 A No sir, I wouldn't say  
18 fish spawning in Shallow Bay, but I say that if that  
19 June-July period --

20 Q Fish migrating?

21 A Right, and we are there-  
22 fore looking at the white fishes again, ciscos, inconnu,  
23 and perhaps more importantly it is also the route used  
24 by the only two Arctic char populations that we are  
25 aware of within the Mackenzie District, those being the  
26 Rat and the Cache Creek.

27 Q The Rat River and what  
28 was the other one?

29 A Cache Creek, a tributary  
30 of the Big Fish River.



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Q Did you say Cache Creek?

A Cache, right.

Q C-A-C-H-E?

A C-A-C-H-E. So as I say if indeed this is a dredge crossing, and it occurs at that time, what will the effects be, how will they react to that dredging operation? How are they going to react to increases in silt levels, not only from the trench itself but from the spoil area which presumably would be downstream of the trench, and how are they going to react to any alterations of flow? For instance over the spoil pile or for that matter around a berm if a berm is used, so I say we have not had specific impact studies related to that area but with the crossing now we have additional questions.

THE COMMISSIONER: Well, Mr. Bayly and Mr. Marshall, these are important issues which Mr. Stein has raised but may I suggest we proceed in this way? We are not in the delta stage of this thing yet, and it may be useful to you, Mr. Marshall, and your advisors to have had these matters raised so you will be in a position to deal with them when we go to INuvik in January; but I would suggest that they, having been raised in this very helpful way, that we shouldn't try to explore the whole situation of the delta now. Is that -- I see the usefulness of your raising them now and I think it will help Arctic Gas in preparing their case -- presentation in Inuvik, but --

MR. BAYLY: I'm not trying to take advantage of the situation, except that I have no





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1  
2 ability to know whether these gentlemen will be back  
3 another time, and they're the ones who will be doing --

4 THE COMMISSIONER: No, I think  
5 you were right to bring these things up. I just think  
6 we've got enough to do here without trying to explore  
7 the whole delta.

8 MR. BAYLY: I won't go into  
9 it too deeply, sir. I do have a couple of questions that  
10 follow up just on the season of this migration, but I  
11 will leave it at that.

12 THE COMMISSIONER: Well, carry  
13 on, follow it up.

14 MR. BAYLY: I also suggest we  
15 may have a lot to do in Inuvik and --

16 THE COMMISSIONER: You what?

17 MR. BAYLY: I also suggest we  
18 will have a lot to do in Inuvik and whether we can bring  
19 these gentlemen back to discuss that as well there, may  
20 be difficult.

21 THE COMMISSIONER: Well, carry  
22 on.

23 MR. BAYLY:Q Now, Mr. Stein,  
24 you've raised these as concerns, and you've stated that  
25 the migrations of these fishes through Shallow Bay may  
26 well take place at the time or shortly after the whales  
27 have calved in Shallow Bay. Now, how long do these  
28 migrations take, do you know that? Or over what period  
29 do they extend?  
30

WITNESS STEIN: I'll try and give



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1  
2 it to you from memory. It will be fairly close, I think.  
3 Again it varies with the species, it will vary from  
4 year to year as well; but I would say we have observed,  
5 as I recall now, some migrations starting as early as  
6 very late July, usually I would say it would be mid-  
7 August. Again that's for some species, maybe not for  
8 others, and I'm trying to talk generally now.

9 But you're also faced now with  
10 the downstream migration too, of these post-spawning  
11 fish, so if we can take that as a reasonably close  
12 figure, meaning mid-August, you can expect probably to  
13 see these returning migrations running into early Novem-  
14 ber.

15 Q All right, and so during  
16 this quite long season from the end of July at the  
17 very earliest to November, this area is teeming with  
18 life going in both directions, with aquatic life going  
19 in both directions.

20 A Generally that would be  
21 accurate, yes.

22 MR. BAYLY: Yes.

23 THE COMMISSIONER: Mr. Bayly,  
24 I think that we'll adjourn now till two o'clock.

25 MR. BAYLY: All right.

26 THE COMMISSIONER: I'm afraid  
27 we just won't be able to sit till 12:30 so we'll adjourn  
28 now until two o'clock.

29 (PROCEEDINGS ADJOURNED TO 2 P.M.)  
30



1 PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 MR. BAYLY: Gentlemen, before  
3 we leave the --

4 MR. ANTHONY: Excuse me,  
5 Mr. Bayly and Mr. Commissioner, I was wondering if Mr.  
6 Stein might be able to start this afternoon by  
7 responding to some questions that Mr. Marshall had  
8 asked yesterday afternoon that Mr. Stein said he would  
9 search out the information and I think that he has  
10 some responses that he would like to put on the  
11 record?

12 THE COMMISSIONER: Go ahead,  
13 Mr. Stein.

14 WITNESS STEIN: Well, if I  
15 may, Mr. Commissioner, I would like to elaborate on  
16 some of the answers to Mr. Marshall's questions of  
17 yesterday. As I recall, Mr. Marshall asked if I would  
18 identify some specific stream systems in which whitefish,  
19 ciscos and inconnus spawn. I have quickly reviewed  
20 some of our past reports and as I think I have indicated  
21 previously, the majority of spawning areas are unknown.  
22 For mountain whitefish which we would classify as a  
23 minor species, we have identified the Rabbitskin River  
24 as a spawning stream with the Jean Marie River as a  
25 suspected spawning site.

26 All other spawning areas with  
27 the exception of the mouth of the Arctic Red River  
28 are suspected only, and these are: inconnu: upstream  
29 tributaires of the Arctic Red, Peel and Mackenzie  
30 Rivers; Arctic cisco: tributaries of the Arctic Red,





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1 peel and Mountain Rivers; least cisco: probably the  
2 lower reaches of the Mackenzie ; broad whitefish:  
3 back eddies of the Delta and Mackenzie, and we have  
4 also identified the mouth of the Arctic Red River as  
5 a spawning site for this species; humpback whitefish:  
6 back eddies of the Mackenzie and Delta.

7 I think the second part of  
8 th question was are any known spawning streams for  
9 these species crossed by the proposed route? Since  
10 known sites have not been identified by ourselves,  
11 nor as far as I am aware by Dr. McCart, the answer  
12 would have to be, I don't know. Mr. Marshall also  
13 noted that many of the stream systems we identified  
14 as being sensitive, are not crossed by the proposed  
15 route. I only wanted to point out here that under the  
16 mandate given to us in 1971 we were required to consider  
17 the possibilities of both a gas and an oil pipeline  
18 and to investigate both sides of the Mackenzie River.  
19 This was obviously modified somewhat as time and  
20 plans progressed.

21 In discussing the char  
22 fishery on Cache Creek, I quoted the estimated population  
23 size from our 1973 report as being between 12,000 and  
24 17,000 fish. To add to that, we also estimated the  
25 total catch at between five and seven thousand fish.  
26 If we were to use our maximum catch figures and our  
27 minimum population estimate, approximately 58% of the  
28 catchable population would have been removed. I would  
29 again say that we are risking over-harvesting.

30 I also talked to Mr. Hugh



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1 Trudeau, head of enforcement for the N.W.T., Fisheries  
2 and Marine Service, and he informed me that our  
3 fisheries officer in Inuvik has been periodically  
4 keeping watch on this fishery, has on occasion had  
5 discussions with people in Aklavik concerning such  
6 things as fishing methods and has been attempting to  
7 log estimated catch figures. This officer in the past  
8 has also had to direct seismic operations away from the  
9 fishing area as an added protection against further  
10 exploitation.

11 I would also add, just to  
12 touch on the question of work done on downstream  
13 effects of siltation, there are research scientists,  
14 specifically Drs. N. Snow and D. Rosenberg who have  
15 done considerable work on siltation under the pipeline  
16 program. I am not aware of whether they attempted  
17 to determine the maximum downstream effects nor do I  
18 have the report references at hand, though I expect  
19 that some of these reports have already been tabled  
20 at this Inquiry.

21 MR. BAYLY: Mr. Stein, before  
22 we leave the question of the Shallow Bay area, just  
23 a couple of questions. First of all, you have iden-  
24 tified the period of calving for the whales as being  
25 one after which construction of the Shallow Bay  
26 crossing would commence. I gather you haven't, in your  
27 date of the middle of July, I believe it was, included  
28 a period in which calves generally stay in the bay after  
29 calving, is that correct?





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 A I would have to assume  
2 so, sir. The figures that I gave I located somewhere  
3 in past testimony.

4 Q All right. The other  
5 issue that you raised, and it takes me back to the  
6 question of whether migration routes may be critical  
7 for certain species, I take it with regard to that  
8 area of Shallow Bay as it represents a migration route  
9 for a number of species, you would consider it at  
10 least very important and perhaps critical to the health  
11 of the populations using that.

12 A I would consider the  
13 critical factor here to be ensured passage through the  
14 area. I don't think I would say that the entire area  
15 would be critical as such.

16 Q On the question of routing  
17 we have from this panel assessments of the relative  
18 dangers to fish of the prime and interior routes, with  
19 some discussion of the Fairbanks corridor as well, and  
20 the opinion of the panel appears to be divided. Some  
21 people feel that the North Slope should be avoided;  
22 others seem to feel that the interior should be avoided,  
23 and Mr. Walker seems to feel that the Fairbanks corridor  
24 should be considered very carefully as an alternate  
25 to both of those routes. Am I correct in my assessment  
26 of the feelings of the panel on that?

27 THE COMMISSIONER: The panel  
28 nodded their assent.

29 MR. BAYLY: Yes, thank you for  
30 the record.



Stein, Walker  
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Cross-Exam by Bayly

1 Q Now, I was curious, there  
2 were opinions given that the interior was fragile because  
3 there were a large number of species, 17, I believe, of  
4 fish that might be affected by any damage caused by  
5 the pipeline, and another opinion given that because on  
6 the North Slope there are only two major species using  
7 the rivers there, that that too might be important or  
8 even in some ways more important if one of those  
9 populations in an individual stream, for example, were  
10 decimated by some failure of the pipe or some siltation  
11 or something of that sort. What I'm having difficulty  
12 sorting out, and perhaps the panel in general can help  
13 me out, is whether this assessment is based on the same  
14 kinds of concerns from the panelists. Do you contemplate  
15 for example that in the interior route the concern is  
16 that any failure might damage 17 species, Mr. Walker?

17 WITNESS WALKER: Well, first  
18 of all, in looking at a route and route alternatives,  
19 Mr. Steigenberger addressed himself to the two North  
20 Yukon routes and utilizing a number of criteria, decided  
21 on that the best route from a fisheries standpoint,  
22 fisheries point of view, the best route for a pipeline  
23 or the one giving the least number of problems is the  
24 North Slope or prime route. In final summary, he came  
25 to this conclusion on the basis that, in the event of  
26 damage arising in one way or another, the damage on the  
27 North Slope would be confined largely to one watershed,  
28 one set of populations, whereas if you look at it on  
29 the Porcupine route, damage would affect many systems,  
30 many streams, particularly possibly the Porcupine River



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1  
2 itself, and of course many populations because that is  
3 a complex within itself. So the opportunities for damage  
4 are very much greater on the interior or alternate route  
5 than on the prime route.

6 Q Go ahead.

7 THE COMMISSIONER: Carry on,  
8 please.

9 A Now, I was directed to  
10 give some consideration to the two South Yukon routes,  
11 and I cannot use quite the same criteria as Mr. Steigen-  
12 berger used because our information is not as complete.  
13 As I mentioned earlier, our available information is  
14 that which was obtained over the years through various  
15 programs, utilizing regular funds. So we looked at  
16 population size and watershed characteristics, plus  
17 access , and on the basis of these generalities we came  
18 to the conclusion -- at least I came to the conclusion  
19 that there may be fewer problems, but there were some  
20 advantages of having a pipeline along the Fairbanks  
21 route over that of the Fort Yukon route.

22 Now I was further asked,  
23 "O.K., Mr. Steigenberger has identified the most  
24 northern route and I have identified the most southern  
25 route. How do you compare these two?"

26 So we addressed ourselves to  
27 that and on the basis of the same factors as I've men-  
28 tioned yesterday, we came to the conclusion that there  
29 were several advantages for a pipeline on the Fairbanks  
30 route rather than the prime route.





1 Q Right.

2 A So they are independent  
3 assessments.

4 Q Would it be correct,  
5 Mr. Steigenberger, that your assessment was based on  
6 choosing between the two routes selected by the  
7 applicant as Prime and Alternate?

8 WITNESS STEIGENBERGER: Since  
9 the research that I conducted was principally oriented  
10 to those two routes, I would say yes. I also have  
11 during the past/<sup>summer</sup>worked on a section of the Yukon  
12 River in the southern Yukon and I could comment on pos-  
13 sibly a third alternative which is a Fort Yukon Route  
14 and if I had to make a decision on those three routes,  
15 I would still select the prime route because the  
16 Fort Yukon Route during 1975, we think, guesstimate,  
17 if you want to call it, that there is probably 200,000  
18 chums upstream of Dawson City in the Yukon River, and  
19 there is between 15,000 and 30,000 chinooks utilizing  
20 the river. So, having been on some experience on  
21 all three of those routes, I would still select the  
22 prime route, not having been on the Fairbanks Corridor  
23 and therefore having no direct experience, I wouldn't  
24 make a decision on the Fairbanks route.

25 Q All right, and Mr.  
26 Steigenberger, was your opinion with regard to the  
27 selection of the coastal prime route made at the time  
28 that the applicant had proposed to come down adjacent  
29 to the Richardson Mountains or did that include your  
30 feeling about crossing Shallow Bay and joining up that



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1 way with the gas plants on the Tuk Peninsula and  
2 Richard's Island?

3 A The Shallow Bay diversion  
4 or new alignment, is something that has come to pass  
5 in the very immediate past, and as I have stated before,  
6 after the 31st of March 1975, Fisheries Service,  
7 Vancouver, was not conducting specific pipeline related  
8 studies in the Yukon. So, basically we haven't been  
9 doing research on that.

10 Q But that wasn't included  
11 in your assessment of the two routes that you compared?

12 A No.

13 Q In order to compare them  
14 at this stage, because you haven't had an opportunity to  
15 study them, you would have to depend on people like  
16 Mr. Stein and people in his area and their assessment  
17 of that part of the route?

18 A I think that is princi-  
19 pally delta phase and segments of the Beaufort Sea  
20 program, and it would probably be better discussed by  
21 people who are more qualified in that discipline than  
22 myself.

23 Q I gather part of your  
24 feeling, Mr. Steigenberger, on the preference was the  
25 dependency of people on fish resources in the Interior  
26 as opposed to the dependency of fish resources on the  
27 coast, would that be fair to say?

28 A Yes, that is -- it's on  
29 page 17 of my testimony.

30 Q Well, I gather though that





Stein, Walker,  
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Cross-Exam by Bayly

1 that again does not take into account the use made by  
2 Mackenzie River fish of the coastal lagoons along the  
3 North Slope of the Yukon in that they may be fish that  
4 are used by people in the Mackenzie Delta?

5 A I would answer yes  
6 to that question.

7 Q Yes, that it does or  
8 yes that it doesn't?

9 A You know, again it is  
10 in an area that I am not entirely qualified to answer  
11 that question.

12 Q Well, let me just put  
13 it this way then. The dependency on the fishery that  
14 you contemplated on the North Slope, I take it, was the  
15 char fishery, either domestic or commercial, or  
16 domestic or potential commercial?

17 A On the North Slope, the  
18 only domestic dependency that we observed was at  
19 Komakuk and Shingle Point and at Komakuk there  
20 was only one family utilizing a small number of fish.

21 Bob Mackenzie on Herschel Island using some  
22 more, and Shingle Point, one Eskimo that is resident  
23 at the DEW line station. You have these other factors  
24 of people coming out from Aklavik historically and  
25 being at Shingle Point, you know, for the last 30 to  
26 50 years, but their fishing or utilization in that  
27 area was primarily on a daily requirement basis for  
28 what they needed to use immediately. However, there  
29 was one individual, George Allen, who came out there  
30 regularly for the last fifteen years and has harvested



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1 200 to 300 broad whitefish for this winter supply, but  
2 the people at Aklavik that were at Shingle Point,  
3 fishing was incidental to caribou and beluga  
4 hunting, the hunting of beluga whales.

5 Q And that would tide  
6 them over, I gather, while they were waiting for these  
7 other food sources? I am not suggesting that they  
8 took very many, but it might be that these are  
9 important sources to the individuals involved?

10 A I think most of them  
11 from Aklavik fish closer to home, as a matter of  
12 transporting the fish and they just use their daily  
13 requirements for dogs. There are five or six dogs  
14 there.

15 Q Now, what I am suggesting  
16 to you though, when you were assessing fisheries, you  
17 were assessing fisheries that took place in the areas  
18 as opposed to areas that were used by fish, the  
19 fishery of which might have been in the Mackenzie  
20 Delta?

21 A Yes.

22 THE COMMISSIONER: What was  
23 that again? That phrase, "the fishery of which..." kind  
24 of threw me.

25 MR. BAYLY: What I said, Mr.  
26 Commissioner, was that some fish use the North Slope,  
27 the coastal lagoons, but people don't fish them there,  
28 they fish them in the Mackenzie- Delta when they come  
29 back, but nonetheless these fish do use the area that  
30 Mr. Steigenberger studied. He just did not study  
fisheries in those areas because people don't fish  
them there.



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Cross-Exam by Bayly

1  
2 MR. ANTHONY: I thought I  
3 was with him but now I'm not so sure. I don't know if  
4 the witness wants to at this point.

5 A Mr. Stein & Company  
6 conducted a tagging program at Shingle Point with hopes  
7 that we'd get returns in the Mackenzie Delta, perhaps  
8 he could comment on that phase of his studies.

9 MR. BAYLY: Q Would you make  
10 that clearer than I did, Mr. Stein?

11 WITNESS STEIN: I'm not so  
12 sure that I can.

13 Q Do you understand it?

14 A You're, I think, saying  
15 that the delta fishery is the domestic fishery, but  
16 the fish that are being utilized at that fishery are  
17 also utilizing habitat along the coast. Is that --

18 Q Yes.

19 THE COMMISSIONER: Yes, that's  
20 what I thought. Then he went on from there and baffled  
21 me; but maybe if we stop there that's all we need to  
22 know.

23 MR. BAYLY: I think it's as  
24 simple as that, Mr. Commissioner. My sentence made it  
25 complicated.

26 Q You'd agree with the way  
27 you expressed my point?

28 A I have to.

29 Q Now, one of the reasons  
30 that I bring that up, and I will come back to this a





Stein, Walker  
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1 little later, is that if for example there were a  
2 spill of fuel oil at a site where pipeline materials  
3 were being staged, on the North Slope, it might affect  
4 fish that people traditionally catch in the Mackenzie  
5 Delta. Yes, would you agree with that, Mr. Stein?

6 WITNESS STEIN: A Yes, I'd agree with that.

7 MR. MARSHALL: Mr. Bayly, I  
8 see you have paused. I mentioned this morning that  
9 there was a paper dealing with the distribution of  
10 fish along the Beaufort Sea coast. This is a report  
11 of Craig & McCart that is found as an appendix to  
12 Chapter 2, Volume 34 in the Biological Report series.

13 MR. BAYLY: Can I go on?

14 THE COMMISSIONER: Yes.

15 MR. BAYLY: Q One of the  
16 difficulties, though, I understand, in comparing the  
17 two routes in the fashion that deals with fish taken  
18 by human beings, and Mr. Steigenberger, you may want to  
19 comment on this, is that in the one area, that is along  
20 the North Slope and in the Mackenzie Delta, all those  
21 fish taken by people are for domestic use, or by angling,  
22 whereas there is another element in the Porcupine drain-  
23 age and that is commercial fisheries.

24 WITNESS STEIGENBERGER: There's  
25 no commercial fisheries in the Yukon, northern part of  
26 the Yukon. I'd like to clarify that. There is no  
27 commercial fishing in the area of study related to the  
28 two pipeline routes, therefore the Porcupine and the  
29 Beaufort Sea Drainage.

30 Q I want to turn your attention



Stein, Walker  
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Cross-Exam by Bayly

1 now to those discussions which led up to the decision  
2 that Arctic Gas would sponsor studies on -- in the Yukon  
3 and that the Fisheries Department would study fish in  
4 the Mackenzie drainage. Can you tell me -- I think per-  
5 haps Mr. Walker, I initially address these questions  
6 to you -- how is it determined that you would divide  
7 up the work this way? Was it --

8 WITNESS WALKER: The Pacific  
9 Region, at least in Vancouver, has authority for  
10 British Columbia and Yukon within its jurisdiction;  
11 whereas the Central Region, based at Winnipeg has the  
12 Northwest Territories and mid-Canada provinces. So  
13 there is a dividing line in authority, and that is  
14 on the Yukon-Northwest Territory boundary, and if you  
15 extend that seaward from the coast, well there is a  
16 line of authority. Of course that doesn't mean much  
17 biologically.

18 Q Right, but it does in  
19 terms -- that was the logical way, administratively, I  
20 gather, to divide up the way of studying this.

21 A Well, that was the way it  
22 was insisted upon by higher authority.

23 Q All right.

24 MR. MARSHALL: Mr. Bayly, Dr. McCart  
25 has taken issue with your summation what you say his  
26 evidence was on this point.

27 MR. BAYLY: I don't think I  
28 said anything about his evidence on this point.

29 MR. MARSHALL: About the division  
30 --





Stein, Walker  
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Cross-Exam by Bayly

1 THE COMMISSIONER: That came up  
2 this morning. It was suggested that Dr. McCart had wor-  
3 ked on the North Coast, leaving it to the government  
4 to work in the Mackenzie Valley. Wasn't that what you  
5 said this morning?

6 MR. BAYLY: I believe so, that  
7 Dr. McCart had stated he'd done his work on the North  
8 Slope and at least as far as some studies on some  
9 species in the Mackenzie were concerned, that he had  
10 an agreement with Fisheries that they would do some of  
11 those studies.

12 THE COMMISSIONER: Well, in  
13 any event, where is all this getting us? What's this  
14 in aid of? Who cares whether Dr. McCart and Fisheries  
15 split it up, or Fisheries split it up among themselves  
16 because Winnipeg has jurisdiction over this and so forth  
17 and so on?

18 MR. BAYLY: I'm not worried about  
19 that, Mr. Commissioner, but what I am concerned with  
20 is whether the two of them were conducting studies to  
21 find out the same things, whether those things had any-  
22 thing to do with the impact of the pipeline and predict-  
23 ing what it might be. That's what they're here for.

24 THE COMMISSIONER: Yes, but  
25 Dr. McCart has been on the stand for a number of days  
26 and has talked constantly about his work to determine  
27 what the impact of a pipeline would be. If he wasn't  
28 working on that, I don't know what he was doing, and  
29 similarly with these gentlemen, they have indicated  
30 that their work wasn't perhaps quite so specifically



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related to pipeline construction, but they must have  
views on that. What's the -- where does this -



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MR. BAYLY: Well, Mr.

Commissioner, you have to decide whether the studies that have been done are going to be able to help you in saying what the impacts were and if these gentlemen can tell us --

THE COMMISSIONER: What the impacts will be --

MR. BAYLY: Oh, sorry, what the impacts will be. I hope it isn't were by the time we get there.

(LAUGHTER)

MR. MARSHALL: I am glad that it was Mr. Bayly who said that and not me.

MR. BAYLY: I know I am asking all of Mr. Marshall's questions so he won't take very long. But what the concern is here, sir, is whether or not what has been studied, both by these people and by Dr. McCart can tell us that, and these gentlemen are experts, they will tell us what they studied. If it is different from the kinds of things that Dr. McCart studied, I would like to know why, because it may be that combined they can tell us what the impacts are likely to be or it may be that they studied things completely differently and we will have to figure out whether we could argue that one has assessed the impact in one area and the other has not reached that point yet, or something quite different. As far as who is responsible for what, I don't think that that matters in the least, but as





1 far as what they decided to do and how they decided to  
2 share their data to see what the effects were likely  
3 to be, that may be very important.

4 THE COMMISSIONER: Well,  
5 the burden of the evidence of this panel so far has  
6 been to indicate the areas where we have an incomplete  
7 knowledge of fish populations and so forth and  
8 to indicate in detail, for which we are all grateful, the  
9 mitigative measures that should be taken where our  
10 knowledge is sufficiently complete to allow us to  
11 predict impact and to take steps to limit impact.

12 Well, all right, maybe the  
13 panel having heard this discussion, would you object  
14 if we just asked them to comment on it? They must  
15 understand the point that you are concerned about  
16 now.

17 MR. BAYLY: I hope so, I  
18 am not sure that I do now.

19 THE COMMISSIONER: Well, do you  
20 have any comment, Mr. Stein? You represent the  
21 Winnipeg end of this consortium.

22 MR. MARSHALL: I guess I am  
23 the one remaining in ignorance then, sir. Is it--  
24 are there areas that were studied by Fisheries Service,  
25 -- or I am sorry, are there areas that have not been  
26 studied by either the Fisheries Service or McCart and  
27 his people --

28 THE COMMISSIONER: I think  
29 Mr. Bayly's point is that it may be that this panel  
30 was doing their work with larger purposes in mind than



Stein, Walker  
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1 simply a pipeline and that Dr. McCart, having been  
2 retained by Arctic Gas was directing his whole efforts  
3 to determining the impact of a pipeline. That is  
4 it, isn't it? Or isn't it?

5 MR. BAYLY: That is the  
6 start of it, sir.

7 THE COMMISSIONER: That is the  
8 start of it --

9 MR. BAYLY: If I can get  
10 my foot in the door with that one --

11 THE COMMISSIONER: Well, you  
12 go ahead then, I should stay out of it, I guess.

13 MR. BAYLY: Well, let's  
14 start with that. Were you, and perhaps Mr. Walker  
15 would care to think of this, and Mr. Stein, were you  
16 looking at the four year study plan with the prime  
17 purpose of assessing the impact\$ that a pipeline would  
18 have on fish and other aquatic species?

19 WITNESS STEIN: Yes, I would  
20 say so.

21 WITNESS WALKER: Also, yes.

22 Q The difference between  
23 you and Arctic Gas then appears to be that Dr. McCart  
24 says that based on certain assumptions of the ability  
25 of the applicant to do what it says it can do, he is  
26 satisfied that a pipeline could cross the North  
27 Slope or go through the Interior, though he is not as  
28 happy with that route, without adversely affecting  
29 aquatic ecosystems.

30 THE COMMISSIONER: Provided





Stein, Walker,  
Steigenberger, Millen  
Cross-Exam by Bayly

1 the measures are taken that Dr. McCart has urged upon  
2 us.

3 MR. BAYLY: Yes.

4 A You said gas pipeline?

5 Q Yes.

6 A Yes.

7 Q And that is what they  
8 have said and do you agree with that?

9 A Generally yes.

10 Q And, MR. Stein, do you  
11 agree with that with regard to the species that you  
12 have studied?

13 WITNESS STEIN: Could you  
14 just --

15 THE COMMISSIONER: I wish  
16 I knew exactly where we are at. I thought that taking  
17 the northern Yukon coast that Mr. Steigenberger was  
18 saying to us that there were a number of fish populations  
19 on the North Coast that we had not as yet complete  
20 knowledge of and that it would take one to three years  
21 to complete the assembling of the data relating to those  
22 fish populations and that no pipeline should be built  
23 until then. Dr. McCart has told us, as I understand it,  
24 that he is in a position to indicate the critical areas,  
25 leaving aside the precise meaning of critical, the  
26 important areas where you have to protect fish popula-  
27 tions along the North Coast, and he has identified those,  
28 he says, that's that, here are the measures to take  
29 to protect them, let's get started. Now, there is a  
30 difference of opinion here.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 MR. BAYLY: Well, that was  
2 my understanding, yes, this morning.

3 THE COMMISSIONER: I gather  
4 from what Mr. Stein says he is essentially saying the  
5 same thing about the Mackenzie Valley, and so now you  
6 are asking Mr. Walker if he agrees with what Dr. McCart  
7 has said about the North Coast, and he said he agreed  
8 with Dr. McCart. I don't know whether that is what you  
9 did say, that's why I interrupted, to make sure that  
10 I don't fall off at the first turn here.

11 MR. BAYLY: Well, let's go  
12 back to the point of the morning and see if we can  
13 clarify it this way, would you all agree that the amounts  
14 of time that you indicated was needed for further  
15 study would be required and those studies would have  
16 to be done before you would feel as a panel that you  
17 could adequately assess the potential impacts and  
18 recommend mitigative measures, and procedures and  
19 cautionary measures that should be taken to protect  
20 fisheries?

21 WITNESS WALKER: Yes, after  
22 one to three years of study. Also, we were thinking of  
23 winter construction and we were thinking of a single  
24 line.

25 MR. BAYLY: Yes.

26 THE COMMISSIONER: Yes, and  
27 you're not -- you are saying that your answer of  
28 one to three years is on the assumption that a  
29 gas pipeline built in the winter --

30 A That is right, sir.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 Q And then if we throw  
2 an oil pipeline or a highway, an all-weather highway  
3 into the package, that you won't stand by the answer you  
4 have given, you have to take a look at that?

5 A Those are additive  
6 factors, sir, yes.

7 THE COMMISSIONER: Yes.

8 MR. BAYLY: And you tried  
9 not to duplicate the studies that Dr. McCart was doing  
10 because that may have an added impact on fish if you  
11 both studied the same fish in the same river is that  
12 correct?

13 A That is correct.

14 Q And did you go over the  
15 methods that you both used to see whether they were  
16 consistent so that you would be talking about the  
17 same things if you were both doing parallel assessments?

18 A We discussed the object-  
19 ives, the kinds of information that each group would  
20 be taking, methods and following -- and in the course  
21 of the study and also following it we discussed  
22 results and so we were aware of each others findings  
23 and progress.

24 Q So, in a sense you looked  
25 at the results that Dr. McCart obtained and -- but you  
26 are still in the position of saying that further  
27 work should be done, at least by Fisheries, before you  
28 would be satisfied with your own ability to make  
29 an impact assessment?

30 A Yes, sir.





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 Q Now, when you made your  
2 studies, did you take these following as basic  
3 assumptions, and I think that we have gone over this  
4 slightly before, that the fish populations you were  
5 studying were in a stable condition, and I think that  
6 I asked that of Mr. Stein, but not of the others.

7 A That the populations were  
8 in a stable condition?

9 Q Yes.

10 A Yes.

11 Q And you, too, Mr.  
12 Steigenberger?

13 WITNESS STEIGENBERGER: You  
14 would have to say that -- you would have to make  
15 an assumption that there are normal distribution and  
16 that they are not undergoing dynamic changes, but  
17 that you can have variation thrown in there to make it  
18 a little more difficult to comprehend.

19

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Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 Q You have to start with  
4 that assumption in beginning studies of this kind, I  
3 understand; is that correct?

4 A Yes.

5 Q They may turn out to have  
6 been the wrong assumptions, if you've been studying them  
7 for ten years and find out there's a gradual increase.  
8 I'm not criticizing it, I'm just saying that you have  
9 to start with that. Is that correct?

10 A That's correct.

11 WITNESS WALKER: That's correct.

12 Q And what you didn't start  
13 with, all of you, was the assumption that where fish  
14 are is the only criteria for a critical or important  
15 habitat for fish; you looked for characteristics as  
16 well as places where fish are.

17 A Generally, yes.

18 Q Is that true, Mr. Steigen-  
19 berger?

20 WITNESS STEIGENBERGER: I might  
21 point out that now there's different life stages of  
22 fish, and I'm not too sure whether you're considering  
23 eggs fish in the --

24 Q I do really consider them  
25 fish and perhaps wrongly so, but I consider that part of  
26 their life cycle.

27 A So then spawning grounds  
28 with eggs are equivalent to fish.

29 Q Yes.

30 A Then I would agree.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 Q And then Mr. Millen has  
2 told us that one of the difficult and expensive things  
3 to do is to determine places where fish are not, or I  
4 suppose that means where fish are not ever; is that what  
5 that is supposed to mean, Mr. Millen?

6 WITNESS MILLEN: That's what I  
7 was intending to mean.

8 Q Yes, and that may depend  
9 on certain cycles that are not fully understood as  
10 yet with regard to certain species.

11 A You better not go too  
12 far with that with me. What I was really referring to  
13 was small streams where one typically could find fish  
14 in the summer but clearly not in winter, and it's quite  
15 a task to establish that there are never any fish in  
16 those streams in summer.

17 Q And I gather one of the  
18 dangers, and this is one that was pointed out to me by  
19 Dr. McCart, and I can't remember for Mr. Marshall's  
20 benefit whether this was over coffee or in evidence,  
21 but generally if you sampled every stream you might  
22 find that you had to wipe out the fish in some of the  
23 smaller streams to find out if they were there, and  
24 that's one of the problems in studying every stream.  
25 Would you generally agree with that as a panel?

26 WITNESS WALKER: Probably more  
27 a problem of resources to study every stream.

28 Q Isn't it more than that,  
29 that you wouldn't want to study every little stream in  
30 case it was one that supported a small population that





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1 sampling would hurt more than just ignoring it?

2 A Well, we can sample without  
3 killing fish and we would attempt not to injure them  
4 in areas where there are small populations. Live  
5 measurements release and would provide us with  
6 the information.

7 Q Now, if I can refer Mr.  
8 Walker to your evidence at page 3, it brings me to my  
9 next concern, and my concern is that there are examples  
10 in the Mackenzie area of development which Fisheries  
11 studies could have been conducted in, but which for  
12 one reason and another, and I know Mr. Steigenberger  
13 was outlining some of these, have not been carried out.  
14 Let me go over some of these. Can you tell me first of  
15 all, was a study initiated prior to the construction --  
16 that is a Fisheries study -- prior to the construction  
17 of the Ringling River crossing on the Dempster Highway?  
18 Do you know, Mr. Stein?

19 WITNESS STEIN: I think Mr.  
20 Millen could probably answer that one for you.

21 Q All right, Mr. Millen,  
22 could you speak to that question?

23 WITNESS MILLEN: There wasn't  
24 a study of the stream crossing site which was - had  
25 been specifically designed because of the highway, as  
26 far as I recall. A crew based in Aklavik had been  
27 sampling that stream as part of the regular survey  
28 samplings. They had sampled lower down in the river,  
29 as I understand.

30 Q Now that was a crossing



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1 that we've been informed ran into problems because of  
2 the collapse of culverts which apparently caused a  
3 major siltation referred to by Dr. McCart as the Ringling  
4 River disaster. Did the Fisheries Department do follow-  
5 up studies on the effects of that siltation on either  
6 fish or on other aquatic species, benthic invertebrates,  
7 for example?

8 A Yes, I understand that  
9 Dr. Norman Snow, who <sup>was</sup> working in Inuvik at the time,  
10 as part of the pipeline study program and who is  
11 specializing in invertebrate studies did take some  
12 samples after that event, as soon afterwards as he  
13 could get out there. I don't really know what his  
14 conclusions were.

15 Q All right. Perhaps Mr.  
16 Stein, do you know what conclusions he reached, or not?

17 WITNESS STEIN: No. I think one  
18 of the basic problems here that would have been involved  
19 is that we did not have sufficient lead time really  
20 to get in there and collect baseline information, be it  
21 fish, be it invertebrate, water quality, so on. We  
22 did have samples. They were sporadic and I don't think  
23 sufficient enough in my mind to put together the  
24 basis of a good followup study.

25 Q All right, and when you  
26 say "lead time" was that prior to the installation of  
27 this crossing?

28 A Yes, certainly, we would  
29 like to have seen what the condition was of that  
30 stream before any disturbance occurred.



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1 Q What was the date that  
2 that crossing was put in? Perhaps Mr. Millen knows.

3 WITNESS MILLEN: No, I don't  
4 believe I do.

5 Q I don't mean the exact  
6 day, but can you tell me whether it was after 1971  
7 when this four-year program that you --

8 A It was certainly after  
9 1971,

10 Q It was probably the winter  
11 of 1973-1974, would that be about right?

12 A That seems like it, yes.

13 Q And did you recommend  
14 and perhaps Mr. Stein can answer this, did you recommend  
15 that studies be conducted of that stream before the  
16 crossing went in as part of the program that you were  
17 involved in?

18 WITNESS STEIN:  
19 A No, I don't recall making  
20 that recommendation. We were taking samples as  
21 part of the pipeline project, this was in the very lower  
22 reaches. As Mr. Millen pointed out, we did have a crew  
23 that was in there for a brief period of time and I  
24 can't recall offhand why we avoided that particular  
25 portion of it; but our effort primarily was in the  
26 mouth, as it was with most of the tributary streams.

27 Q Mr. Millen, were you  
28 involved in the decision to use that oval shaped  
29 culvert, if I can call them that?

30 WITNESS MILLEN: Yes, I was.

Q And I gather that in the





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1  
2 past those culverts had performed well, but in this case  
3 there was a failure. Can you tell us anything about  
4 those culverts in terms of whether they should be  
5 recommended or not recommended for this or the other  
6 applicant, if they're going to use culverts in stream  
7 crossings?

8 A Yes, those were very large  
9 culverts that were selected by the Department of Public  
10 Works for that particular site. The extent of my recom-  
11 mendations involved the amount of waterway that should  
12 be provided so that the velocities through that crossing  
13 would not impede the migration of fish. The selection of  
14 the means of providing that waterway was entirely in  
15 the hands of the Department of Public Works, and although  
16 we certainly encouraged them to use large sized culverts,  
17 particularly oval ones which provide a better ratio  
18 of stream bottom, as it were, available in the stream  
19 crossing. I think D.P.W. have now decided that those  
20 size of culverts are an unreasonable risk to use in the  
21 construction circumstances that they faced in the Arctic  
22 and I would agree with that decision that they've made.

23 Q Yes. That has nothing to  
24 do with the basic shape, I gather. It's just a question  
25 of the size of the culverts.

26 A It's the size of the  
27 culvert and the kind of -- and quality of construction  
28 that they can expect in the winter in the Arctic.

29 Q Now, there was also a  
30 fish culvert installed at that crossing, I understand,



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1  
2  
3 at a slightly higher elevation than those culverts to  
4 take the main portion of the stream.

4 A That's right.

5 Q And was it a baffled or  
6 an unbaffled culvert?

7 A In a sense it was baffled.  
8 The culvert body itself was not, but the intake structure  
9 at the upper end of that culvert was specifically  
10 designed to aid fish through that culvert.

11 Q All right, and when you  
12 say that I can't picture that in my mind. What did it  
13 look like?

14 A Essentially the channel  
15 upstream from the culvert had some baffles in it, and  
16 that reduced the flow through the culvert sufficient  
17 that fish passage through that culvert would be aided.

18 Q Now, as I understand,  
19 Dr. McCart has criticized baffled culverts in part on  
20 the basis that the baffles are sometimes too far apart  
21 for very small fish, which generally take advantage  
22 of the bottom configuration of a river so that they can  
23 hide behind rocks in the little eddys, so that they  
24 can make their way up. Was that something that was  
25 considered in the decision to use --  
26  
27  
28  
29  
30



Stein, Walker,  
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1 MR. MARSHALL: Dr. McCart  
2 says that that is not what his evidence was. He  
3 said that baffles caused difficulty with icing,  
4 Mr. Bayly.

5 THE COMMISSIONER: What is that  
6 again?

7 MR. MARSHALL: He indicated  
8 that baffles caused problems with icing.

9 A I can perhaps clarify  
10 that in this particular case if you want to understand  
11 the Rengleng installation better. That was not  
12 the principle -- the principle here was merely to  
13 keep the amount of water flowing through that culvert  
14 at a given stage of the river down to a lesser amount  
15 than would naturally flow through the culvert and  
16 baffles of a type that cause icing problems or  
17 difficulties for small fish were not involved.

18 THE COMMISSIONER: I think  
19 that we will adjourn for coffee now.

20  
21 (PROCEEDINGS ADJOURNED)

22  
23 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

24 MR. ANTHONY: Mr. Commissioner,  
25 we have lost, I hope only temporarily Mr. Stein, but  
26 I believe Mr. Bayly feels he can carry on in his  
27 absence.

28 THE COMMISSIONER: Yes.

29 MR. BAYLY: Let's move on to  
30 another river crossing, and I believe it is on the





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1 Rock River, that is crossed by the Dempster. That was  
2 an occasion where consruction methods resulted in  
3 changes in the river and I wonder if Fisheries monitored  
4 that. Perhaps, Mr. Walker, you could tell us to your  
5 knowledge what happened at that crossing.

6 WITNESS WALKER: I have  
7 no information on that particular crossing. I  
8 had phoned the Whitehorse office, but they had no  
9 information either.

10 Q I see, does that mean  
11 that they didn't study that crossing?

12 A I don't quite understand  
13 what the situation is in regard to that.

14 Q Perhaps Mr. Steigenberger  
15 has some information on that he either knows or has  
16 heard from people in the office. Do you have any, sir?

17 WITNESS STEIGENBERGER: We  
18 were under the impression that large diameter culverts  
19 had been installed in the Rock River and had been  
20 backfilled forty vertical feet and that sometime in  
21 the spring it had washed out and we contacted the  
22 Whitehorse Fisheries office and they said that the  
23 Dempster Highway construction had not reached this  
24 point as yet and I think it was on the drawing boards  
25 that they were going to install culverts in the  
26 Rock River and have a bridge on the Eagle, and so that  
27 is all I can say and I think that is why Mr. Walker  
28 said that he doesn't have any information. It is  
29 probably a misinterpretation of a discussion in another  
30 area that we are unaware of.



Stein, Walker  
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1 Q Well, let's go to one  
2 that we have some evidence before this Inquiry on, and  
3 that is on the Pointed Mountain pipeline, the Kotaneelee  
4 river crossing is one where there has been some problem  
5 with the crossing and its having to be covered with  
6 more material, possibly resulting in siltation. Is  
7 this something that Fisheries has monitored or is  
8 going to monitor?

9 WITNESS WALKER: Pacific  
10 region personnel looked at the La Biche River crossing in  
11 the winter of '71 - '72 with a view toward getting  
12 some idea of the activities associated with pipeline  
13 crossings of streams and also some of the problems  
14 encountered as they may affect the Fisheries resource.  
15 They also took a number of measurements on sediment,  
16 but only four measurements in total. Anyhow, it was  
17 very limited sampling, and also the limiting factor  
18 in looking at the La Biche was that there were no before  
19 hand measurements. We had no knowledge at all of the  
20 situation, and so we really didn't accomplish  
21 very much.

22 The other objective of the  
23 program was to -- in thinking about sedimentation,  
24 specifically, was to come up with the theoretical  
25 formula. Given sediment or stream bed size particles  
26 and given stream flows in terms of volumes and veloci-  
27 ties to calculate what the deposition may be in  
28 distance in time from the disturbance point.

29 Q Now, I realize that in  
30 the example that you have given of the La Biche River



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1 the one that I have given of the Kotaneelee and the  
2 other one I gave of the Rengleng River crossing,  
3 that you didn't have the advantage of going in there  
4 before hand, but I invite you to agree with me that  
5 there may be some value in going afterwards, finding  
6 out what the situation is, and sampling the populations  
7 in the stream to determine<sup>at</sup> what rate, if at all, they  
8 recover; and has that been considered by your office?

9 A Yes, it was considered,  
10 however, there were certain problems associated with  
11 manpower resources and that and in trying to organize  
12 and orientate towards the two pipeline routes that  
13 were given us. We had enough problems -- looking in  
14 those directions as to looking elsewhere. So we had  
15 to weigh one factor against another.

16 Q Given an ideal world  
17 personnel and budget you would have carried out those  
18 studies?

19 A We would have continued  
20 with the La Biche.

21 Q All right, and the studies  
22 that you have proposed are the ones that you, Mr.  
23 Millen, have outlined on three streams that are proposed  
24 to be crossed by the Mackenzie Highway, and those will  
25 be the first opportunity, as I understand it, the  
26 Fisheries will have to monitor streams before, during  
27 and after construction of crossings, is that correct,  
28 in the Mackenzie region? Or is that Mr. Stein?

29 WITNESS MILLEN: It was  
30 Mr. Stein that mentioned that before, but I wouldn't





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1 agree with you that that is the first time. Certainly  
2 in the case of the Martin River, both our own group  
3 and the research people who were located in Fort  
4 Simpson and followed that event quite closely, both  
5 with prior sampling before the highway approached the  
6 stream, with sampling at the time that the temporary  
7 crossing was put in and subsequently.

8 Q All right, and was there  
9 any failure in that crossing that would give you an  
10 ability to monitor the effects of that?

11

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Stein, Walker  
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1 A There were two minor  
2 failures, one of the cleared slopes that was cleared  
3 for the highway right-of-way had a permafrost failure,  
4 and some of the approach material to the temporary  
5 bridge crossing washed out as well.

6 Q Now, is that study on the  
7 Martin River one in which reports have been generated  
8 which may be assessed?

9 A Yes.

10 Q Are those, to your know-  
11 ledge, listed on the list of government reports that  
12 has been presented by Commission counsel?

13 MR. ANTHONY: Mr. Commissioner,  
14 I don't think -- certainly I may have been in error  
15 but I didn't review the government list of reports  
16 published or filed by Commission counsel last fall with  
17 the panel. I just ensured that they listed the ones  
18 they were going to be referring to or relying on.  
19 Perhaps Mr. Bayly could leave that with me and I could  
20 review it with Commission counsel, and if they haven't  
21 been listed I'd assume the next step would be to ask  
22 Commission counsel to assist in obtaining them and  
23 having those before the Inquiry and I'll do what I can  
24 to assist in that process.

25 MR. BAYLY: I'm content with  
26 that, Mr. Commissioner.

27 THE COMMISSIONER: Mr. Stein?

28 WITNESS STEIN: I just wanted  
29 to add a couple of points here. One is that there is  
30 only one report from that study. Secondly, that this



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1 was another study which I think reference was made to  
2 it in the past, that ran into considerable problems,  
3 one being changing water conditions as the study progres-  
4 sed, another one being, it seems to be coming a more  
5 and more frequent problem that after the initiation of  
6 a study the crossing site was then changed on us again.

7 THE COMMISSIONER: That sort of  
8 thing can happen.

9 MR. BAYLY: Mr. Stein, one of  
10 the concerns that you may share is that the studies that  
11 you have anticipated for these three streams that are  
12 to be crossed by the Mackenzie Highway may not be comple-  
13 ted prior to commencement of construction of one of the  
14 pipelines that has been proposed.

15 A With the understanding that  
16 I have right now of pipeline construction scheduling,  
17 I suspect that yes, we may be facing a problem.

18 However, if I could elabor-  
19 ate on that slightly more. There may be an added advan-  
20 tage in this and actually the initial objectives of the  
21 project may be far from lost. We were hoping to  
22 essentially study the effects of a crossing. Without  
23 having the list of objectives of that study directly in  
24 front of me I would assume that it would not make that  
25 much difference, be it a pipeline crossing or be it a  
26 highway crossing.

27 Q All right

28 A A second point would be  
29 that reference has been made frequently to potential  
30 additive effects from such things as multiple crossings,





Stein, Walker  
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1 so it may actually be a gift in disguise.

2 Q In terms of its experi-  
3 mental value, it may be more useful.

4 A I'm sorry, I didn't get  
5 that.

6 Q In terms of its experimen-  
7 tal value then, it may be more useful.

8 A It has that potential, I  
9 would say, yes.

10 Q Whether it's more damaging  
11 or not, you won't know till after.

12 A That's true.

13 Q Now, I wonder if you  
14 agree with this, Mr. Watson, I'm looking at your  
15 recommendations Numbered 1 to 4 on page 3 of your  
16 evidence, and wondering whether you would --

17 THE COMMISSIONER: Mr. Walker.

18 MR. BAYLY: -- Mr. Walker,  
19 yes, he's the one who made the recommendations, and  
20 wondering whether you would agree with me that a No. 5  
21 might well be added, and that is to test the measures  
22 that you've referred to in No. 4, as I gather  
23 that may have been the purpose in setting up the study  
24 of the three rivers that are to be crossed by the  
25 Mackenzie Highway.

26 WITNESS WALKER: I don't under-  
27 stand the latter part of your question where you make  
28 reference to the Mackenzie Valley Highway.

29 Q Your fourth point in your  
30 recommendation is to recommend measures that will



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1 prevent degradation of the environment during construc-  
2 tion and operation of the pipeline. Now would you agree  
3 that it might be useful to add a No. 5 recommendation,  
4 testing these measures?

5 A Well, at this --

6 MR. MARSHALL: Mr. Bayly, are  
7 you dealing with this list of sub objectives that he  
8 said the reports were based on, or am I looking at the  
9 wrong page?

10 MR. BAYLY: No, you're looking  
11 at the right page.

12 MR. MARSHALL: I thought you  
13 said "recommendations".

14 M R. BAYLY: No. 4 is a  
15 recommendation.

16 A That point you mentioned  
17 would be a concern that I'd have possibly from this  
18 point and on, but I wouldn't say it was an objective  
19 at that time.

20 Q All right, but if you were  
21 re-writing them today you would consider adding that?

22 A Not necessarily.

23 Q All right.

24 A I'm not sure that I would  
25 include that.

26 Q O.K. However, in the  
27 sense that you will be looking at three crossings before  
28 and after on the Mackenzie Highway, according to the  
29 evidence of Mr. Stein, in a sense you will at least be  
30 monitoring.



Stein, Walker  
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1  
2 A Well, he will be looking  
3 at three crossings.

4 Q All right. Winnipeg as  
5 opposed to Vancouver.

6 A Yes.

7 Q Now, Mr. Stein, will these  
8 studies on the three rivers include the total aquatic  
9 environment of the three streams in question, or only  
10 fish of certain types? Or fish or species of certain  
11 types?

12 WITNESS STEIN: The emphasis  
13 on the program, I would say, is being placed on water  
14 quality and invertebrate populations. These being  
15 those aspects of the aquatic environment which are  
16 going to react first and possibly greatest to any  
17 additional sediment problem, these are being studied  
18 as well. If I was to prioritize them I would do it that  
19 way.

20 Q Have you surveyed these  
21 three streams to see whether they support a large enough  
22 population of the invertebrates that you would want a  
23 study to permit the kind of studies you'd like to  
24 carry out?

25 A This study was initiated  
26 this summer. As I said, we were looking for one-year  
27 pre-construction data. It was collected and is being  
28 analyzed at this time. I believe the indications are  
29 that there should be no problems.

30 Q All right. Now, going





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1  
2 back to my point of your taking as a given that the  
3 fish populations are at a normal level, that they are  
4 neither in decline nor in an upswing, I invite you to  
5 agree that if the decline appears during, prior, or  
6 following construction, that in the absence of seeing  
7 dead fish or finding spawning grounds which you know  
8 of that are actually destroyed or damaged by siltation,  
9 it will be difficult to say whether this is a natural  
10 decline or a man-made or man-initiated decline. Would  
11 you agree with that, Mr. Stein?

12 A Unless we are looking  
13 perhaps at a toxic effect again, and here I am referring  
14 to the possibility of also taking water samples without  
15 dead fish, it is going to be difficult, yes.

16 Q Yes, and in a toxic example  
17 you can analyze either the water or the fish to find out  
18 if there is a substance which you don't normally find  
19 in either of those.

20 A Which you would not nor-  
21 mally find, yes.

22 Q And we've gone over with  
23 Mr. Watson the fact that at the moment reliance on  
24 re-stocking is a -- I'm sorry, Mr. Walker -- is something  
25 that we can't rely on at present. Would you agree with  
26 that, with regard to the fish that you have studied?

27 WITNESS WALKER:

28 A I'm sorry, is that  
29 directed at me?

30 Q Yes.

A Could you repeat that?



Stein, Walker  
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1 Q Mr. Walker has said  
2 that at least as far as the species on the North  
3 Slope are concerned, char, in particular, restocking is  
4 a possibility, but it is one in which there are a lot  
5 of unknowns, would you agree with regard to the species  
6 that you have studied?

7 A Yes, I would agree with  
8 that.

9 Q And if there are declines,  
10 has Fisheries looked at the possibility of curtailing  
11 or putting limits on the domestic Fishery?

12 A You are now talking  
13 management and enforcement which is a little out of  
14 my area. At the present time we do not manage the  
15 domestic Fishery. It would be a viable possibility  
16 under certain circumstances, I would think.

17 Q And it is also a  
18 management problem, I suggest, as to whether there  
19 should be some scheme of alternatives or compensation  
20 made available to people who depend on the local  
21 domestic fisheries?

22 A I think here, sir, you  
23 are getting into the socio-economic field and I would  
24 just as soon avoid that if possible. I don't think  
25 that I am qualified to talk on it.

26 Q But your department, a  
27 different area of it, would have to face that?

28 A Presumably a different  
29 department, yes.

30 Q It's like going into get



Stein, Walker  
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1 your driver's licence.

2 Now, let's turn our attention  
3 to the domestic fishery, and you have gone over  
4 for us the methods that you used to assess the domestic  
5 fishery. Has anybody on the panel looked at the  
6 domestic fishery historically to see whether the catches  
7 that are now being made, represent in numbers and in  
8 areas from which they are taken, the same areas that  
9 have historically been used and the same numbers that  
10 have historically been taken?

11 A In the Mackenzie we have  
12 not attempted to determine what the historical catch  
13 figures were, no. I think it would be a very difficult  
14 thing to put together and with questionable reliability.  
15 We certainly did attempt to determine any historical  
16 fishing sites.

17 Q Have you done an  
18 attempt on that, Mr. Steigenberger?

19 WITNESS STEIGENBERGER: With  
20 regard to that in Northern Yukon Fisheries Studies,  
21 Volume I, Chapter 5, I guess it is "Historical Ex-  
22 ploitation of the Fisheries Resource in the Northern  
23 Yukon Territory", and it is about a 60 page document,  
24 and it has been published, and it is available in  
25 Volume I, Technical Report, PAC-T75-19.

26 Q Now, without reading  
27 the entire 60 pages, is there a summary that you could  
28 make or a comment that you could make with regard to  
29 this? Mr. Stein has suggested that it would be  
30 difficult and that the accuracy would be questionable





Stein, Walker  
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1 With regard to the report that you have referred to  
2 were those problems that you ran into?

3 A I am not sure of your  
4 question. Could you rephrase it, please?

5 Q Mr. Stein said that for  
6 the Mackenzie domestic fishery historically  
7 there are difficulties in assembling the information.  
8 I assume that that means that it is not readily available  
9 and he would have reservations about its accuracy. Now,  
10 I gather that you did this other study for the Northern  
11 Yukon. Did you run into difficulty in obtaining the  
12 information and have you certain reservations about  
13 its accuracy?

14 A I don't believe that  
15 I have any reservations about its accuracy. Some of  
16 the information was obtained from the archives and from  
17 the DIAND library in Ottawa, and I think that it is a  
18 fair assessment of the domestic fishery in the Northern  
19 Yukon.

20 I believe Dr. McCart tabled  
21 very recently a similar literature survey of the  
22 domestic fisheries in the Yukon, so I am not too  
23 sure that that is too difficult to obtain in the  
24 Mackenzie Delta either.

25 Q Did you, in your  
26 report, try to assess the position of the domestic  
27 fishery in terms of its importance to certain native  
28 peoples in the northern Yukon?

29 A Yes, we did.

30 Q Can you compare in extent



Stein, Walker  
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1 both geographically and in terms of catch, the  
2 historical fishery in the northern Yukon with the  
3 present day domestic fishery?

4 A Within the northern  
5 Yukon if you, you know, divided in that area that is  
6 along the coast, historically around 1900 there was  
7 a population around 4,000 Eskimos within the Yukon  
8 Territory and there was a village at Shingle Point  
9 that numbered approximately 350 permanent residents,  
10 and today with that population having an unknown,  
11 unidentified harvest of the fish population. Today  
12 there is essentially three permanent year-round  
13 residents in the northern Yukon, substantially less  
14 harvest.

15 Within the Interior route  
16 and the Porcupine system, the population of Old  
17 Crow is down from 1920 to 1935, principally because of  
18 meningitis and diptheria, where they lost a large  
19 segment of the population. The harvest historically  
20 was principally by traps and home made gill nets and  
21 I think the harvest -- I am not too sure whether it's --  
22 the only thing I can say about it, I believe it was  
23 more difficult to catch fish historically than it is  
24 today because there appears to be an increase in abundance,  
25 because it is easier to catch fish now than  
26 it was previously.

27 THE COMMISSIONER: Excuse  
28 me, Mr. Steigenberger. You said that at the turn of  
29 the century there would have been about 4,000  
30 Eskimo people living in the north there, in the Yukon



Stein, Walker  
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1 coast?

2 A I believe that is right.  
3 That is principally for the whaling industry along the  
4 coast.

5 Q Yes, and they would have  
6 used the fishery on the northern Yukon for a substantial  
7 part of their diet, I should think, whales and caribou  
8 as well, but speaking of fish pure and simple now, that  
9 fishery must at the turn of the century have had  
10 the capacity of supporting quite a few people in terms  
11 of their domestic needs.

12 A I am sure that it did.

13 Q And are you able to  
14 say whether there has been any diminution in that  
15 fishery between then and now?

16 A I am afraid that I  
17 didn't understanding the word you used.

18 Q Well, all right. Has  
19 the fishery gotten smaller, are there less fish there  
20 now than there were in 1900?

21 A I am not too sure about  
22 the abundance of fish, but the utilization is definitely  
23 less.

24 Q Oh, yes, no doubt about  
25 that. You said that it is easier to catch fish  
26 there now. Is that just because there would be  
27 fewer people catching them?

28 A You know, talking with  
29 Peter Lord from the village of Old Crow, you know, he  
30 talked of times in 1937 to 1939 where they would fish





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1 for a whole month and they would catch very few  
2 fish because the people are utilizing more fish and  
3 were more dependent on it. Now, he says that, you  
4 know, there has been a change in the philosophy, the  
5 availability of other products besides fish and  
6 he said in general terms that there seemed to be a  
7 greater abundance of fish and they appeared to be  
8 easier to harvest.

9 I would also like to point  
10 out that he said that the quantity of fish that  
11 were harvested using traps was probably greater, you  
12 know, that so that a fish trap on the Old Crow River  
13 would havest in the order of, you know, it was not  
14 uncommon to have between ten and twenty tons of  
15 fish put into a ground cache that is, say, fifteen  
16 feet square and four feet high and assume a weight  
17 of 65 pounds per cubic foot, a substantial tonnage  
18 historically.

19 MR. BAYLY: You have had a  
20 look at the domestic fishery and I think that Mr.  
21 Stein gave evidence of this this morning over a  
22 two year period and fish is only part of the diet, but  
23 perhaps you can address yourself to this, Mr. Steigen-  
24 berger, when the caribou are scarce, the use of the  
25 fish as part of the diet becomes more important and more  
26 fish have to be caught, would you agree with that  
27 at least historically?

28 A In principal, yes, but  
29 I would qualify that in that the harvest is dependent  
30 upon the availability of gill nets, the availability of



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1 other type of work, at least at the present day.

2 Q Now, with regard to  
3 domestic fisheries and you have studied these, I  
4 invite you to agree with the fact that if a person or  
5 a family requires a certain amount of fish for  
6 their winter needs, that they will fish until they  
7 catch that number if at all possible whether it  
8 takes a week or two weeks or even longer?

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Stein, Walker  
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1  
2 A I would specifically for  
3 Old Crow I would disagree with that. They principally  
4 fish on a seasonal basis and lots of people only take  
5 between 40 and 50 fish, which they feel is adequate  
6 for themselves now. Sometimes they'll catch it in one  
7 day; sometimes they have only one net and they lose it  
8 and they quit fishing and they don't have any fish.

9 Q All right; but you have  
10 said this, that they may feel that 50 is adequate, but  
11 if they have to set their nets three or four times to  
12 get 50 fish and the nets aren't swept away, they will  
13 probably do so.

14 A They usually use all the  
15 fish that they catch.

16 Q Right. Now, if we assume  
17 let us say a natural disaster to a year class of a  
18 population on a river on the North Slope, we have heard  
19 that the species -- sorry, the population has the ability  
20 to come back. Now I gather that doesn't take into con-  
21 sideration domestic fishing which puts another tax on  
22 that fish population in a year where there might have  
23 been a natural disaster of this sort.

24 A No, I think I lost you  
25 in the question. Your questions are long and drawn out  
26 with explanations. I'm sorry, but can you make them  
27 a little briefer?

28 Q Sure. There is the  
29 possibility that fish overwintering in an area may be  
30 frozen out over a winter in a certain area. Do you agree?





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1 A It's possible.

2 Q And if it's in a river  
3 with Arctic char it may be an overwintering juvenile  
4 population in one of the areas identified by Dr. McCart.

5 A Yes, but you know, these  
6 fish have been here for a long time and they're  
7 adapted to -- I mean if the population exists, they  
8 may, you know the groundwater sources aren't likely to  
9 freeze in the normal course of events. So that we're  
10 looking at populations that are relatively stable, that  
11 will have fluctuations in numbers.

12 Q And does that take into  
13 account domestic fishing? You'd expressed concern yester-  
14 day in questions directed to you by Mr. Marshall of  
15 fishing in the Big Fish River which I gather you may  
16 feel -- maybe it's Mr. Stein -- has been over-fished.

17 A Well, if I could read you  
18 a section from one of my other publications, 74-20, page  
19 43, Section B, it says, and I quote:

20 Q Does it have a name?

21 A It's 74-20, it's a tabled  
22 report and it's called:

23 "Northern Yukon Fisheries Studies, 1973,"  
24 by myself and others. I refer you to page 43 and I say  
25 in Section B:

26 "Recreational fishing is increasing and more  
27 regulations, particularly regulations concerning  
28 areas that should be protected such as overwintering  
29 and spawning areas and groundwater areas are  
30 necessary to prevent over-exploitation."



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It says:

"Similar regulations with regard to critical areas should apply to a regulated domestic fishery."

So that I am aware of the problem. I've presented it in -- to somebody and it's up to management and people in regulatory things to either heed or reject my recommendation.

Q Sure, and if you take heavy fishing in a given stream and you combine it with a possible effect, and I don't say it will happen, but possible effects from the pipeline, that may force the regulation of a domestic fishery in a certain area that isn't being regulated at present. Do you agree?

A I agree, but you could also have no detrimental effects and still be forced with regulation from over-exploitation. So it's a circular argument.

MR. BAYLY: Mr. Commissioner, perhaps to assist other counsel, that report 74-20 is Exhibit 380, before the Inquiry.

THE COMMISSIONER: Thank you.

MR. BAYLY: Q Mr. Stein, if I can refer to your evidence at page 4, that's starting at the paragraph on page -- the bottom of page 3, you say:

"I consider it imperative that every effort be made to afford maximum protection to the resource as a whole, a resource whose utilization and value will increase substantially as development of the Mackenzie Valley continues."



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1 Does that mean you contemplate  
2 a commercial fishery being put into the Mackenzie Valley?

3 WITNESS STEIN: I think in  
4 certain areas in the Mackenzie there is that potential,  
5 yes.

6 Q And do you feel that your  
7 assessment of the fish resources in the Mackenzie is  
8 at a sufficiently sophisticated level for you to be able  
9 to recommend the size of the commercial fisheries, what  
10 species, maximum catches, etc.?

11 A Our Management Division  
12 right now has a catch quota on the fishery operating  
13 from Holmes Creek. It is conceivable that that  
14 fishery -- I am speaking now for them and not for  
15 myself, I do not have the authority to manage that  
16 fishery --

17 Q I understand.

18 A -- it is conceivable that,  
19 to my way of thinking at least, for some time they  
20 probably could get by on the existing data as far as  
21 altering catch quotas. I think it's inevitable, if  
22 you want to carry this to the extreme, that there may  
23 be numerous commercial fisheries, and the day is going  
24 to come when they are going to have to -- someone is  
25 going to have to be able to break that delta fishery  
26 into individual populations, and then start managing  
27 on a population basis.

28 Q All right, and what will  
29 the commercial fishery do to/<sup>the</sup> domestic fishery? I gather  
30 that they will be harvesting fish from the same populations.





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1 A That would be correct, yes.  
2 If they, let's say they both expand at a given rate,  
3 then they are going to be competing.

4 Q And do the contemplations  
5 for increasing the commercial fishery in the Mackenzie  
6 result from consultation with native peoples who are  
7 involved in domestic fisheries?

8 MR. ANTHONY: Well, in fairness  
9 to the witness, I believe you said that the possibility  
10 existed, and I don't think/<sup>he said</sup>it was contemplated or --  
11 either by himself or by the fisheries Management  
12 Branch.

13 A I was speaking quite  
14 hypothetically there.

15 MR. BAYLY: Q So what you mean  
16 by this paragraph is not that the value will increase  
17 but that the value may increase, substantially.

18 A That is correct.

19 Q Let's go onto methanol  
20 testing. Now, I gather you've looked at Dr. McCart's  
21 data on his laboratory methanol tests. Can you tell me  
22 whether you know of any evidence that methanol in  
23 combination with other substance may be more or less  
24 toxic than reagent methanol?

25 A I am not aware of any  
26 evidence of that nature, no.

27 Q Now, if methanol -- and  
28 perhaps Mr. Millen has an opinion on this -- if methanol  
29 solutions are used in sections of the pipe over and  
30 over again, would you contemplate as an engineer that



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1 they would retain the purity that they started with?

2 WITNESS MILLEN: No, I would  
3 not expect they would remain pure. It's quite a good  
4 solvent and I would expect it would pick up some  
5 contaminants from the pipe.

6 Q All right, and if it did  
7 pick up contaminants as Mr. Millen has suggested that  
8 it might, would any of the fisheries biologists on the  
9 panel be concerned with the effects of the methanol in  
10 combination with other chemicals being different from  
11 the effects of the methanol as tested by Dr. McCart?

12 MR. MARSHALL: What other  
13 chemicals? There's no evidence given by this witness  
14 about other chemicals, or indeed by anybody else that  
15 I am aware of.

16 MR. BAYLY: Mr. Commissioner,  
17 you just heard Mr. Millen say that there is a possibility  
18 and I didn't put it any higher than that, that --

19 MR. MARSHALL: He mentioned  
20 contaminants, which could be dirt or a shovel or  
21 something of that sort left in the pipe, but chemicals --

22 MR. BAYLY: Call it materials  
23 then, substances, if Mr. Marshall objects to the term  
24 "chemicals".

25 Q Is that satisfactory, sir?

26 THE COMMISSIONER: Well, I  
27 suppose it is, but just so long as the witness isn't  
28 misled, that is so long as we all understand we're not  
29 necessarily talking about any chemical or toxic substance.

30 MR. BAYLY: All right, I don't



Stein, Walker  
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1 know what it might be, sir.

2 THE COMMISSIONER: Pardon me?

3 MR. BAYLY: I don't know what  
4 it might be.

5 MR. MARSHALL: Well, sir, I  
6 think this was explored at some length by a number of  
7 counsel. They were trying to find out whether <sup>there would be</sup> some  
8 other coating substances such as are used to preserve  
9 pipe stockpiled for Alyeska or something of that sort,  
10 and they were told there would be some sort of a epoxy  
11 coating on the inside of the pipe to be put on in the  
12 mill as I recollect it that's what the evidence was and  
13 notwithstanding the efforts of my learned friends to the  
14 contrary, they weren't able to establish there would be  
15 anything else in there of a chemical nature. I may be  
16 wrong in that, and if so, Mr. Bayly, you have my apology.

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Stein, Walker,  
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MR. ANTHONY: Mr. Commissioner,

I don't know if it would assist to go to Mr. Millen to get any specifics and my friend may wish to pursue that first, but I haven't objected to the question on the assumption that the question is put in a hypothetical basis, and that is do the biologists feel that there may be a difference in impact if there is between pure methanol and a methanol with any other substance or chemical in it. If it is left at that general way the panel may or may not wish to venture a guess, and I don't know whether my friend wishes to pursue with Mr. Millen what sort of additions and whether having pursued that the panel would be in a better position to answer the question.

MR. BAYLY: Let me put it this way, Mr. Commissioner, just so that we don't get each others hackles up, would you gentlemen consider it advisable that before the 1% methanol solution is discharged into northern waters that it be tested to see what, if any, impurities are contained in it so that they could be assessed to see if there would be any toxicity or possible toxicity to aquatic environments? There is no objection to that, is there, Mr. Marshall?

MR. MARSHALL: No.

MR. ANTHONY: Thank you, Mr. Marshall.

MR. MARSHALL: Well, you might ask Mr. Anthony.

MR. ANTHONY: I gather that



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1 question has been directed initially to Mr. Stein as  
2 rephrased by Mr. Bayly. I don't know whether he  
3 wishes to respond.

4 A Did I get that correctly  
5 that it should be tested to see if the methanol is  
6 toxic to fish? Or are you referring specifically to  
7 some conceivable mixture of chemicals?

8 Q Yes, I am asking whether  
9 you would consider recommending that the solution  
10 prior to discharge, the 1% solution prior to discharge,  
11 be analysed to see whether there is anything  
12 else in it that it may have picked up along the  
13 way?

14 A It seems like a reasonable  
15 recommendation to me.

16 Q Allright, would you  
17 agree with that, Mr. Walker?

18 WITNESS WALKER: This is a  
19 test following each section, is it?

20 Q No, I was contemplating  
21 a test prior to the discharge of a 1% solution into  
22 northern waters which is the plan of the applicant to  
23 distill out 99% of the methanol and to discharge  
24 what is left either on to ice or in the new recommenda-  
25 tion of Dr. McCart to meter it out into northern  
26 streams.

27 A Following each test  
28 operation of the pipe?

29 Q Yes, prior to discharge.

30 A Yes, I agree.



Stein, Walker,  
Steigenberger, Millen  
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Q Yes. Mr. Steigenberger?

WITNESS STEIGENBERGER: I would

say yes and I am not too sure whether it is necessary  
for each section of the pipe because I am not too  
sure that ten miles down the road the pipe is any  
different. I would hope that toxicity would include  
eggs.

Q To fish and eggs, yes.

A It would include, you  
know, fish eggs, too, you know.

Q Now, would you as a  
panel of biologists recommend that the methanol  
1% solution be discharged onto ice or would you  
follow -- or would you recommend as Dr. McCart has  
recently done, that it be metered out into the  
stream so that better control could be kept over it.  
Mr. Stein?

WITNESS STEIN: Given only  
those two options?

Q At the moment, yes.

A Then I think it would be  
a valid decision to meter it out.

Q Mr. Walker?

WITNESS WALKER:

A I would agree with  
Mr. Stein 's appraisal.

Q Mr. Steigenberger?

WITNESS STEIGENBERGER: I  
would prefer not to answer that question and have  
someone who is a toxicity expert in the monitoring  
agents that is going to conduct the bio-assay





Stein, Walker  
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1 answer that question.

2 Q Now, there is another  
3 possibility that I have raised with the applicants and  
4 ask you to comment on this, that that 1% solution  
5 not be discharged into northern waters at all, but that  
6 it be shipped back south and disposed of there where  
7 it came from. Do you have any comments to make on  
8 that?

9 WITNESS STEIN: I would  
10 agree with that whole heartedly.

11 Q Mr. Walker?

12 WITNESS WALKER: No comment.

13 Q Mr. Steigenberger?

14 WITNESS STEIGENBERGER: That  
15 is probably in the best interests of <sup>the</sup> fishery resource.  
16 I am not too sure how practical it is.

17 Q And when you say practical  
18 I suppose you are talking about logistics and money?

19 A I would say that, yes.

20 Q Have you any comments on  
21 this particular aspect of the discussion, Mr. Millen?

22 WITNESS MILLEN: It did occur  
23 to me that if that was the procedure, one probably  
24 wouldn't be justified in doing any distillation, but  
25 that was just the approach that I would add to it.  
26 That is, if you didn't want to have any residue then  
27 there wouldn't be much point in distilling the solution.

28 Q Have any of you thought  
29 of the possibility rather than putting it into a  
30 water course of putting it either onto land or putting



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1 it into a fishless body of water, exclusively from a  
2 fisheries point of view? Mr. Stein?

3 WITNESS STEIN: Exclusively  
4 from a fisheries point of view, yes, I would prefer  
5 land disposal by all means with certain provisions.  
6 I would say that these would be, A) that there was  
7 positive assurance that none of the disposed of material  
8 will find its way into a watercourse; B) that it be  
9 fully controlled and I think a possible solution here  
10 would be impermeable dykes; C) I would like again to  
11 see thorough resource studies on any -- how can I  
12 put that -- any watercourses in close proximity. As  
13 purely from a fisheries point of view, as you say,  
14 I am aware that there may be other concerns.

15 Q Yes. Mr. Walker, is that  
16 a question that you care to answer?

17 WITNESS WALKER: In the  
18 last three years of the pipeline study I was more in  
19 a remote situation, you might say, it is a kind of  
20 an advisory -- and I did not undertake serious  
21 consideration of some of these matters, and this one --  
22 also, I depend upon Mr. Steigenberger for that.

23 Q Right. Mr. Steigenberger,  
24 since you have been depended upon --

25 WITNESS STEIGENBERGER: At  
26 times I have advocated that possibly if you use lakes  
27 and take all of the water out of it and fill it up  
28 with testing fluid, after it has been distilled and  
29 then diluted, these areas if they are protected from  
30 other organisms, waterfowl, specifically, would act



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1 in fact as sewage lagoons, if they are monitored and  
2 possibly aeration or some type of secondary treatment,  
3 that the environmental effect would probably be  
4 less than putting them into a watercourse, provided  
5 that the material can stay in a sink or within a lake  
6 and it is not put directly into a watercourse.

7 Q Do you share the  
8 concern that if this 1% solution is disposed of into  
9 a watercourse which finds its way eventually to  
10 the Beaufort Sea, that it may be followed by  
11 similar discharges from testing oil pipelines and  
12 testing the possible looping of the Mackenzie Valley  
13 gas pipeline? Has that been something that you have  
14 considered? Mr. Stein?

15 WITNESS STEIN: I had not  
16 looked at it from that point of view, no.

17 Q All right. Mr. Walker?

18 WITNESS WALKER: No comment.

19 WITNESS STEIGENBERGER: Regard-  
20 less of which way they decide to dispose of it, it could  
21 set a precedence about future disposal methods so that  
22 you might have to look at the long-term effect of this.  
23 I would just like to leave it at that.

24 Q All right. Do you  
25 have any further thoughts on that, Mr. Millen?

26 WITNESS MILLEN: No.

27 Q Now, I gather that at  
28 some point the applicant provided the Fisheries Department  
29 with a list of substances that it intended to use so  
30 that they could be assessed as to their potential impact





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1 on fish and you have received a copy of that list,  
2 I understand. Is that correct, Mr. Stein, or Mr.  
3 Walker?

4 WITNESS STEIN: I received  
5 that list about two weeks ago. I believe that there  
6 were people in our research directorate who had  
7 previous knowledge of what this list was. I would  
8 say, too, or add, too, that yes, I would obviously  
9 be aware of what was in the application.

10 Q And could you tell me  
11 whether either in your research directorate or any-  
12 where else you have had an opportunity to test any  
13 of those chemicals to determine their toxicity on  
14 aquatic species?

15 A Again it is my belief  
16 that there was some toxicity work done by research  
17 scientists. I am not fully aware of what the results  
18 were on that.

19 Q And you have provided  
20 an alternative to methanol testing in your evidence  
21 as a panel, that is, the possibility of hot water  
22 testing, and I realize that there are problems with  
23 that and that they have been discussed. Would you  
24 contemplate with regard to the chemicals on the list  
25 provided to you by Arctic Gas recommending alternatives  
26 to certain of those chemicals arising out of the  
27 results of the research that you will be doing and  
28 are doing?

29 A I am sorry, sir, but  
30 I just don't have the toxicology background to really



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1 comment on that, whether there should be more research  
2 or not.

3 Q All right. You don't  
4 know whether that is being done with that objective  
5 in mind?

6 A No, sir, I do not?

7 Q Do you, Mr. Walker, know  
8 whether that is one of the objectives of this kind  
9 of study within the Fisheries Department?

10 WITNESS WALKER: No, I am  
11 not aware of this list.

12 Q All right, and are any  
13 of you aware of whether any of the chemicals that are  
14 contained on that list, and I guess that I really  
15 have to address this to you, Mr. Stein, as the only  
16 one who has seen the list, have any effects on the  
17 taste of the fish? The palatability of it?

18 WITNESS STEIN: I would  
19 say that in some circumstances that would be a  
20 possibility, yes, but I could not get more specific  
21 than that without knowing the chemical nature or  
22 have an understanding of the chemical nature of  
23 these chemicals, these products.

24 Q And you wouldn't know, I  
25 guess, at this point whether or not the research  
26 directorate is looking into that as one of the  
27 possible effects of the introduction of any of these  
28 chemicals to water?

29 A No, I am not informed  
30 enough on that, sir.



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1 MR. BAYLY: I don't know  
2 if it is possible, Mr. Commissioner, to find out  
3 what work is being done in this area. I would  
4 appreciate, perhaps, if Commission Counsel with  
5 at least access to the Fisheries Department might  
6 look into it and see if any information is being or  
7 has been prepared on this?

8 MR. RYDER: I would certainly  
9 like to know what was the agreement under  
10 which this list was provided to the fisheries, whether  
11 it was a Foothill list or an Arctic Gas list or  
12 both and what fisheries are obliged to do with it  
13 and what Department of Fisheries received it. If you  
14 could let me have that information I certainly  
15 will take it up.

16 MR. BAYLY: I understand  
17 that this list was generated by questions from  
18 Mr. Anthony to the Inquiry and that the list was  
19 forwarded to Dr. Peterson and that it was also  
20 sent by Mr. Hemstock, or I believe that is true,  
21 to Canadian Arctic Resources Committee and I stand  
22 to be corrected on that by Mr. Anthony.  
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1 MR. ANTHONY: Mr. Commissioner,  
2 that is correct in the sense that in response to  
3 questions before this Inquiry, Arctic Gas provided a  
4 list of chemicals that they proposed to use and it has  
5 been reviewed by people who we have contacted and also  
6 has been provided to the government with the request,  
7 as I understand it, that they also have a look at it  
8 and indicate that this information came forward and  
9 they may wish to comment before this Inquiry; and I  
10 don't know who within the government is reviewing that  
11 list. But I would be prepared to work with Commission  
12 counsel to see if we can find out who has been reviewing  
13 it and whether anyone within the government would be  
14 able to provide any information to this Inquiry, giving  
15 their view.

16 MR. BAYLY: Q Mr. Steigenberger,  
17 on page 18 of your evidence you've referred to five  
18 recommendations, and I'm inviting you, sir, at this  
19 point to consider adding a recommendation with regard  
20 to contingency plans and wonder whether you've considered  
21 that.

22 WITNESS STEIGENBERGER: Well,  
23 it's my understanding that the applicant is or has  
24 supplied contingency plans, the adequacy of which I am  
25 unaware, I'm not -- I haven't reviewed them, and probably  
26 am not qualified to comment on them.

27 Q All right, has anyone on  
28 this panel had an opportunity to look at the contingency  
29 plans of the applicant with regard to aquatic environ-  
30 ments and is anyone prepared to comment on them?



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1 MR. ANTHONY: Perhaps the  
2 panel could initially respond to that question by  
3 indicating whether they have seen or reviewed the  
4 contingency plans. They seem to be a bit confused as  
5 to whether or not they are in existence.

6 Mr. Stein?

7 WITNESS STEIN: Not that I can  
8 specifically recall, no.

9 MR. BAYLY: Mr. Walker?

10 WITNESS WALKER: I am not  
11 aware of any detailed contingency plans.

12 MR. BAYLY: Mr. Steigenberger?

13 WITNESS STEIGENBERGER: No.

14 Q And Mr. Millen?

15 WITNESS MILLEN: Yes, my under-  
16 standing was the contingency plans were being revised  
17 so I haven't bothered to go into them in any great  
18 detail.

19 Q Mr. Millen, you have  
20 referred, with regard to wharves and staging sites  
21 especially in relation to river mouths, to (a) recommen-  
22 ding that they not be placed in the vicinity of river  
23 mouths, if possible, and secondly, if they are placed  
24 there that certain things should be done. Would you  
25 classify these as recommendations for contingency plans?

26 A No, I would call that part  
27 of the design of the pipeline system. I don't really  
28 consider that's part of the contingency plan. The wharf  
29 sites are sites which are selected as part of the project  
30 and are not something that you're planning against, as



it were.

"The Past Five Years, Lessons Learned and  
Their Effects on the Mackenzie Delta Planning."  
Dated December 3, 1975, by Everett B. Peterson and  
was presented on December 3, 1975 at the CARC Conference,  
on the Mackenzie Delta.





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 and I spoke to my learned friend about this report,  
2 that is Mr. Anthony, sir, and he says that he is  
3 assembling all the reports from that conference and  
4 will be tabling them before the Inquiry very shortly.  
5 He may wish to comment further on that.

6 MR. ANTHONY: Only to the further  
7 extent, Mr. Commissioner, that this conference held  
8 by Canadian Arctic Resources Committee on December 3rd  
9 and 4th in Ottawa has been reported and all the reports,  
10 publications for that conference which dealt with the  
11 delta are being published, and we will be providing  
12 a list/<sup>and</sup> all these publications as soon as they are  
13 available. I believe Mr. Bayly has this report from  
14 the author himself, and once the publications from  
15 the conference is completed, I will make them available  
16 and I expect that will be probably in early January.

17 MR. BAYLY: I have no objection,  
18 sir, in making this one available today to the Inquiry  
19 providing Mr. Anthony doesn't object, so that other  
20 counsel may have the advantage of looking at it.

21 THE COMMISSIONER: Well, I  
22 think it would be helpful if all of the reports/<sup>of</sup> that  
23 conference are available/<sup>to</sup> the participants in early  
24 January so that they can be examined before the delta  
25 stage of the Inquiry has begun. How are we getting on  
26 with your cross-examination, Mr. Bayly?

27 MR. BAYLY: I have two more  
28 concerns following this one, sir.

29 THE COMMISSIONER: All right.

30 MR. BAYLY: I would anticipate



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 half an hour or less.

2 Q On page 5 of this there  
3 is a statement made as follows, Mr. Steigenberger:

4 "I think that it is better to direct our  
5 scientific attention instead to the important  
6 ecological -- "

7 I'm sorry, a little farther up.

8 "One of the other lessons for me was that the  
9 first objective should be to reduce the tendency  
10 to direct our scientific expertise to specific  
11 industrial or public works projects proposed for  
12 an area. I think that it is better to direct  
13 our scientific attention instead to the important  
14 ecological traits of an area regardless of what  
15 development projects might come along later.  
16 I suggest this because if scientific efforts are  
17 grouped around a specific project, some important  
18 environmental questions are missed."

19 Is that in essence what you are concerned with in  
20 saying that there should be a study based on watersheds  
21 rather than on projects?

22 A I would agree with that  
23 in principle.

24 Q Would you gentlemen be  
25 concerned with regard to the recommendations made to  
26 put the pipeline on the North Slope of the Yukon, if that  
27 were followed at some point by an access road, from  
28 a fisheries point of view? Mr. Walker?

29 WITNESS WALKER: Yes, is that  
30 a permanent road?



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 Q Yes, permanent road  
2 as opposed to a winter road for construction.

3 A Well, that's an additive  
4 factor to the overall scheme. As I understood the  
5 original scheme was for a winter road and a pipeline.

6 Q I'm not meaning to suggest  
7 that this applicant has proposed that, but would that  
8 be a concern of yours with regard to its impact?

9 A Yes, <sup>because</sup> /road-building has  
10 its own areas of concern.

11 Q And I gather that it  
12 also provides access to a large number of potential  
13 anglers that might put a tax on the fish on the North  
14 Slope that might damage populations?

15 A Yes. One might expect  
16 -- well, there's a higher potential for resource use  
17 but that can be taken care of by regulation.

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Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

Q You wouldn't be concerned provided there were regulations?

A Yes, regulations can take care of -- and enforcement -- could take care of additional resource utilization.

Q It might have to be different regulations, I take it, from the ones that exist now in the Northern Yukon.

A Well, there would certainly have to be an enlargement on what exist now.

Q Yes. Would you contemplate any difficulty in enforcement in an area like that?

A Oh, I can't -- no, that  
-- I really can't answer that question.

Q Now, Mr. Walker, I understand that you were involved in a project near Whitehorse and it was an Aishihik Lake. Can you tell us something about that project, especially as to your experience in how it was controlled?

A        I could read to you some notes that I prepared as a result of being a part of that project, and in this note I voice my concerns. I was speaking as a biologist.

Q Could you do that for us,  
sir?

A O.K. I will say that these concerns came about because of certain activities which I observed in connection, as they affected the fishery resource, or had potential effects on the fishery resource.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 THE COMMISSIONER: Where was  
2 this again?

3 A Aishihik Lake, 100 miles  
4 west of Whitehorse. Hydro-electric project. Well,  
5 I have written a note to myself as follows:

6 "I am informed that there is legislation  
7 within the various Acts and regulations to  
8 provide environmental protection in many  
9 ways. However, there are some matters that  
10 may be detrimental to the resource that are  
11 not covered by an Act. These need to be  
12 identified, and an attempt made to incorporate  
13 them into legislation wherever possible or  
14 whenever possible. Where legislation cannot  
15 apply, it is necessary to develop close and  
16 effective liaison between all parties. In  
17 doing this the apparatus for placing non-  
18 legislative recommendations into final design  
19 is very important. The need exists for an  
20 ongoing formal technical committee, probably  
21 among others, for two purposes:  
22 (1) to develop standards and specifications  
23 and understandings prior to construction.  
24 In this regard to prevent misinterpretation of as  
25 many factors as possible should be quantified  
26 for example the percentage composition of  
27 materials going into berms and dykes, the  
28 quantities of gravel for removal from site,  
29 and water for utilization, etc."

30 What I mean by that is you take it out of verbiage and



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 you put it into quantities, quantity values.

2 THE COMMISSIONER: You take it  
3 out of what?

4 A Verbiage, for example  
5 say granular material quantified, give specifications  
6 to that granular material.

7 MR. BAYLY: Call a rock a  
8 rock, in other words.

9 A Excuse me?

10 Q Call a rock a rock --

11 THE COMMISSIONER: You say how  
12 much you're going to use.

13 MR. BAYLY: -- and how many  
14 tons of it you want.

15 A Excuse me?

16 Q Would that be an example  
17 to say that, "We want 100,000 cubic yards of gravel  
18 rather than granular materials as required."

19 A Yes, you quantify  
20 "granular".

21 Q Yes.

22 A Also; and of course in  
23 this quantification as far as materials are concerned  
24 we're looking towards sediments or silt content.

25 Well, the second purpose of  
26 this committee would be to disseminate <sup>new</sup> information  
27 and to provide <sup>guidance</sup> to field personnel when construction  
28 is under way. It's a continuing committee.

29 Now the activities associated  
30 with the implementation of the development are expansive





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 and varied, and it is difficult if not impossible to  
2 identify beforehand all ways in which dangers to  
3 the aquatic resource will arise. Also construction  
4 practices agreed upon in office discussion may not in  
5 practice be interpreted in the same way in the field  
6 situation. Further, learning of construction activities  
7 and of resource increases as the project progresses,  
8 consequently it would be desirable to have on-site  
9 arrangement whereby problems can be discussed, decisions  
10 can be made, and changes can be made to alleviate  
11 problems that arise. That's all I'm saying.

12 Too frequently recommendations  
13 arenot evaluated because no thought is given and/or  
14 no resources are provided to carry out studies following  
15 implementation of the facilities and/or flow schedules.  
16 Hence a valuable part of the whole exercise, that of  
17 learning, in other words follow up on our recommendations,  
18 is lost. The followup studies are mandatory if we are  
19 to improve performance and identify resource changes.

20 That's the end of my note.

21 THE COMMISSIONER: Thank you  
22 very much, Mr. Walker.

23 MR. BAYLY: From this experience  
24 that you had, sir, were you able to --

25 THE COMMISSIONER: Mr. Goudge,  
26 that's something you might like to take under advisement  
27 in connection with the development of proposals when we  
28 reach the matter of enforcement. Sorry, Mr. Bayly.

29 MR. BAYLY: From your experience  
30 which led up to the writing of this note to yourself,



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 sir, would you be able to evaluate the impacts of the  
2 following in any order of intensity, seriousness, or  
3 whatever? They are construction, operation, abandon-  
4 ment, and ancillary development.

5 A Well, --

6 Q Or do they all --

7 A -- not necessarily.

8 What I'm looking toward is a system that takes care of  
9 concerns such as standards and specifications, non-  
10 legislative matters, liaison and understanding, on-  
11 site authorities, to take action of one kind of another  
12 and scientific evaluation. I'm looking for a system.  
13 Does that answer your question?

14 Q Yes, and this would there-  
15 fore apply to all these areas. It would apply to the  
16 construction and pre-construction.

17 A Well yes. Theoretically  
18 if you had the perfect system, well then that would  
19 take care of construction.

20 Q It would follow up and  
21 it would have a look at operations.

22 A Yes.

23 Q And presumably maintenance.

24 A Yes.

25 Q It would look at abandon-  
26 ment which may not have as much relevance in a hydro dam  
27 as it does in a pipeline. Would you agree with that?

28 A Looking in the long term  
29 I suppose that provisions are made for that.

30 Q And I suggest to you that



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Bayly

1 it also has to be a system that can respond to  
2 ancillary developm<sub>e</sub>nt, taking place in the area  
3 adjacent to whatever the facility may be.

4 A That could be built into  
5 it.

6 MR. BAYLY: Yes. Those are all  
7 the questions I have, thank you very much.

8 THE COMMISSIONER: Well, I  
9 think that Mr. Bayly has had the pulling oar so far as  
10 cross-examination of this panel is concerned. I  
11 anticipate that other counsel will find that their  
12 own cross-examinations will have been appropriately  
13 shortened.

14 So I think we'll adjourn  
15 until 9:30 tomorrow morning, then Mr. Hollingworth  
16 and Mr. Ryder and Mr. Bell -- oh, you've cross-examined,  
17 Mr. Bell, haven't you? And Mr. Marshall can complete  
18 his questioning, and then we'll move onto the next  
19 panel after that.

20 (PROCEEDINGS ADJOURNED TO DECEMBER 17, 1975)  
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vol.104

AUTHOR

Mackenzie Valley Pipeline

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MACKENZIE VALLEY PIPELINE INQUIRY

Government  
Publication

IN THE MATTER OF THE APPLICATIONS BY EACH OF  
(a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A  
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS  
CROWN LANDS WITHIN THE YUKON TERRITORY AND  
THE NORTHWEST TERRITORIES, and  
(b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY  
THAT MIGHT BE GRANTED ACROSS CROWN LANDS  
WITHIN THE NORTHWEST TERRITORIES  
FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND  
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,  
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE  
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

December 17, 1975.

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PROCEEDINGS AT INQUIRY

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Volume 105





APPEARANCES:

Mr. Ian G. Scott, Q.C.,  
Mr. Stephen T. Goudge,  
Mr. Alick Ryder and  
Mr. Ian Roland for Mackenzie Valley Pipeline  
Inquiry;

Mr. Pierre Genest, Q.C.,  
Mr. Jack Marshall, and  
Mr. Darryl Carter for Canadian Arctic Gas  
Pipeline Limited;  
Mr. Reginald Gibbs, Q.C.,  
Mr. Alan Hollingworth &  
Mr. John W. Lutes, for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &  
Pro. Alastair Lucas for Canadian Arctic Resources  
Committee;

Mr. Glen W. Bell and  
Mr. Gerry Sutton, for Northwest Territories  
Indian Brotherhood, and  
Metis Association of the  
Northwest Territories;

Mr. John Bayly  
or  
Miss Leslie Lane for Inuit Tapirisat of Canada,  
and The Committee for  
Original Peoples Entitle-  
ment;

Mr. Ron Veale and  
Mr. Allen Lueck for The Council for the Yukon  
Indians;

Mr. Carson H. Templeton, for Environment Protection  
Board;

Mr. David Reesor for Northwest Territories  
Association of Municipal-  
ities;

Mr. Murray Sigler for Northwest Territories  
Chamber of Commerce.

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- In Chief

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Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth  
Yellowknife, N.W.T.

December 17, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. GOUDGE: Before we begin, sir, you will recall sometime in November when Dr. Banfield was here he made reference to certain reports that he said he had had difficulty getting. Subsequently to that Mr. -- Dr. Banfield advised Dr. Fyles and us of those reports, and Dr. Fyles forwarded a list to the appropriate government department and has now received a reply which indicates that of the reports Dr. Banfield wanted, all but two of them were on the government list, and are available.

Two concerning raptors are reports which would require clearance by D.O.E. I propose, sir, just to keep the record complete, we file the list that Dr. Fyles forwarded and the letter in reply to Dr. Fyles from Mr. Bissett of the Department of Indian Affairs & Northern Development.

JEFFERY N. STEIN,  
CHARLES EDWARD WALKER,  
LANCE WILLIAM STEIGENBERGER,  
JOHN M. MILLEN, resumed:

CROSS-EXAMINATION BY MR. HOLLINGWORTH:

Q Mr. Steigenberger, your experience is apparently in the Northern Yukon and not in the Mackenzie District at all, is that correct?

A That's correct.

Q And is any of your evidence then directed towards the Mackenzie Valley part of the proposed pipeline route?



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1  
2 A Not directly.

3 Q Well there are some  
4 comments in your evidence about gravel mining, for  
5 instance, which appeared to have a general application.  
6 I was wondering if you were purporting to apply that  
7 to the entire pipeline, or just to the portion of which  
8 you're familiar?

9 A It's a principle that  
10 applies in general.

11 Q Are there any other parts  
12 of your evidence that you feel are general principles?

13 A The fact that I asked  
14 for some additional research relative to the Coastal  
15 Lagoons on the Northern Yukon and we know that the fish  
16 are you know, part of the same fish stocks that end up  
17 in the Mackenzie. It's mainly a point of contention where  
18 I don't feel there's enough research been done.

19 Q Now on page 16 of your  
20 evidence -- and I think this may have been discussed  
21 yesterday but I wasn't quite clear on it -- there is a  
22 statement of route choice by you where you choose the  
23 coastal route, and I believe you're just considering  
24 the interior and the coastal routes in that choice. Is  
25 that correct?

26 A That's correct.

27 Q You're not taking into  
28 consideration a possible route further south such as  
29 the Fairbanks route?

30 A I have no experience with





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1 the Fairbanks route. There are four alternatives and  
2 I mentioned this yesterday, that the only ones that I  
3 could comment on were the interior, the prime, and  
4 possibly the Fort Yukon because I spent about 4 1/2  
5 months working in that area this summer on a section of  
6 the Yukon River, and still given those three choices  
7 I'd still select the prime route. The Fairbanks corridor,  
8 I have no direct experience with it.

9 Q And on page 18 of your  
10 evidence you state that an oil pipeline would undoubtedly  
11 require permanent roads throughout its length. I was  
12 wondering what the basis for that remark was. What  
13 support led to that comment?

14 A I think TAPS in Alaska  
15 is a good example of that, where they built a permanent  
16 road to construct an oil pipeline.

17 Q Well, I thought that might  
18 be your basis. Do you have any other?

19 A Not basically within the  
20 northern environment.

21 THE COMMISSIONER: Well, Mr.  
22 Steigenberger, you made a point that hadn't been made  
23 here before, at least one of you did, I've forgotten  
24 who did; but you said that a road, an all-weather road  
25 running alongside an oil pipeline would be an asset  
26 for purposes of protecting the fishery so that you could  
27 get to the scene of an oil spill that was threatening  
28 the fish.

29 A I think that's Mr. Walker's  
30 evidence.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

Q Mr. Walker. Well at any rate everyone so far who has come here has spoken of an all-weather road along the North Coast as a threat so to speak, because of the accessibility it offers to people, and Mr. Walker's point was one that hadn't been made. Well, that's fine; but if you had an oil pipeline you might have an all-weather road to provide access for purposes of construction, maintenance and operation, but your fisheries biologist might say, "Well, we want it too so we can get there in case of an oil spill and get there swiftly and surely."

That was the point you made, I thought.

A I think that was correct in some respects, but I think Mr. Walker was referring to the fact that the road was already in existence and it was in fact the actual construction that was of new facilities that would possibly be more detrimental, and I think Dr. Wilimovsky, of the E.P.B. Board, made this mention in previous testimony about the fact that a permanent road newly constructed, I believe, would be ten times more detrimental than a --

(LIST OF REPORTS REQUESTED BY ARCTIC GAS & LETTER  
FROM D. BISSETT DATED DECEMBER 16, 1975 MARKED  
EXHIBIT 386)



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1 THE COMMISSIONER: So did  
2 Dr. McCart. They are all anti-road people, but Mr.  
3 Walker introduced the notion that a road would have  
4 some advantages from the point of view of getting  
5 to the scene to prevent, say, an oil spill damaging  
6 or killing too many fish, that is all.

7 MR. HOLLINGWORTH: I think,  
8 Mr. Steigenberger, the point that you were making in  
9 connection with a road along an oil pipeline was that  
10 it would require more gravel, wasn't it?

11 A That is correct.

12 Q Fine, I was just interes-  
13 ted in the basis for your remarks.

14 A Part of my basis for  
15 that remark is the construction of the 360 miles of  
16 pipeline for TAPS is my understanding that the  
17 gravel requirements to construct that road is more  
18 than the total requirements to construct over 1,400  
19 miles of pipeline as proposed by Arctic Gas, and there  
20 was a news release to that and a newspaper clipping.

21 THE COMMISSIONER: Do you  
22 know how it compares to the gravel requirement for the  
23 Aleyeska pipeline?

24 A I think that is the  
25 gravel requirements that I am referring to, in that,  
26 you know, the road alone was over 30 million cubic  
27 yards or something like that order of magnitude.

28 Q And the Arctic Gas  
29 Pipeline is about 30 million cubic yards?

30 A I believe so, I think





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1 that, you know, just the road construction was greater,  
2 and I am not considering any other facilities.

3 Q No, I was just curious  
4 about the gravel for the Alyeska oil pipeline, not  
5 the road, but the pipeline.

6 A Well, I don't have any  
7 requirements. Those are additional requirements on  
8 top of the road.

9 MR. HOLLINGWORTH: But in  
10 any event when you are speaking about a permanent  
11 road alongside an oil pipeline anywhere else you are  
12 going on the basis of the experience in Alaska and  
13 nothing else?

14 A I think it's just a  
15 general principle, you know. I am not too sure what  
16 you are trying to drive at in the question.

17 Q It is just that you  
18 have made a statement saying that an oil pipeline would  
19 undoubtedly require a permanent road. Now, everyone  
20 is aware that in Alaska there has been a permanent  
21 road built alongside the Alyeska right-of-way, and I  
22 am asking you if you have any further basis for making  
23 that comment than the experience in Alaska?

24 MR. ANTHONY: I think the  
25 witness said that it was on the basis of the Alaska  
26 experience that he'd answered that question, and  
27 in those terms.

28 MR. HOLLINGWORTH: Well, if  
29 that is his answer, that is fine.

30 Q Now, Mr. Stein, in your



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1 evidence you speak about the applicant and it appears  
2 reading it further that you are referring to Arctic  
3 Gas.

4 WITNESS STEIN: Sorry, I  
5 missed that. Would you repeat the question?

6 Q I say, in your evidence  
7 you speak about the Applicant and it appears that you  
8 are referring to Arctic Gas when you say that.

9 A Generally speaking,  
10 yes.

11 Q Now, have you had an  
12 opportunity to study the Foothills application?

13 A The Foothills application  
14 in detail has not been submitted to date to us for  
15 an assessment.

16 Q I see. Well, then are  
17 you in a position to say which of your remarks might  
18 be applicable to the Foothills pipeline proposal then?

19 A I would say that essen-  
20 tially all of the recommendations that I have made  
21 in my testimony would be equally applicable. I think  
22 I made that statement -- if I can just flip back  
23 here --

24 This was a part that I  
25 apparently deleted, but actually what I was saying  
26 is that the specific concerns that I have outlined  
27 apply to any pipeline developer and it is my feeling  
28 that he must thoroughly address these views if he  
29 is determined to provide maximum protection to the  
30 aquatic environment.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

Q Now, again this may be somewhat repetitious from yesterday's evidence and I wasn't able to catch everything that was being said, but at the bottom of the second paragraph, page 3 of your evidence, Mr. Stein, there is a statement that you have very limited data on the vast majority of streams and I was wondering if it follows from this that you feel that all streams in the Mackenzie have to be intensively studied and I think that Mr. Bayly went into this somewhat with you yesterday, but perhaps you could help me out here.

A I think as a general rule as far as a habitat assessment, yes, I think that would apply.

Q And is this something that is carried out in, say, southern Canada?

A I really have no familiarity with the procedures in southern Canada, sir.

Q So you don't know if the vast majority of all streams in southern Canada have been studied in a way that you would suggest for the Mackenzie region?

A I don't have that knowledge, no, sir.

Q Then on page 4 at the end of the first paragraph, you speak of the proximity of, "critical habitats". Looking back through the evidence I saw a discussion of what "significant" meant, and I was just wondering if you had a definition of how you define "critical"?





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1  
2 A As a general definition  
3 I would say that this would be a piece of habitat that  
4 if lost to that resource, that particular population,  
5 say, it's going to have severe repercussions on that  
6 population.

7 Q I suppose that gets into  
8 a discussion, what severe repercussions are.

9 A If you wanted to get into  
10 that.

11 Q If you could.

12 A Let's say it's a spawning  
13 are, if we can take a hypothetical stream with one  
14 limited spawning area for a given species or a given  
15 population, and that particular spawning area is com-  
16 pletely removed as a gravel source, then what you have  
17 done is completely remove all the spawning habitat  
18 within that system. Isn't that correct?

19 Q Yes.

20 A I would consider that  
21 a severe repercussion.

22 Q O.K. Now on page 6  
23 you speak of a recommendation for highway construction  
24 calling for gravel removal operations to be no closer  
25 than 300 feet from any active river channel. I guess  
26 it's Mr. Millen that I want to address this to. I think  
27 he also speaks of a buffer zone of 300 feet from any  
28 water course in his testimony; isn't that right, sir?

29 WITNESS MILLEN: What was the  
30 question?



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

Q Well, it doesn't really matter, it has reference to your evidence that you call for a buffer zone of 300 feet --

A Yes.

Q -- from water courses, and I assume of course that that doesn't apply to a crossing of that water course.

A No, it doesn't.

Q Now, have you studied the Foothills application, Mr. Millen?

A Yes, I have reviewed the alignment.

Q But have you studied the environmental statement?

A No, not in detail.

Q I see. So that you wouldn't be familiar with the recommendation that calls for a buffer strip of 300 feet along land -- of undisturbed land along rivers and streams and beside lakes except for necessary crossings in areas where terrain features do not permit.

A No.

Q You're not familiar with that?

A I hadn't read it before, no.

Q But I assume that would be in line with your recommendations.

A That would be in line with my recommendations.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1  
2 THE COMMISSIONER: And that's  
3 the proposal made by Foothills?

4 MR. HOLLINGWORTH: Yes, it is,  
5 sir. That's contained in the environmental statement on  
6 page 5-B-5.36.

7 THE COMMISSIONER: Mr. Steigen-  
8 berger, you wanted to comment?

9 WITNESS STEIGENBERGER: Yes.

10 Q Pull the microphone over  
11 to you, if you like.

12 A I'd just like to comment  
13 on one comment that Mr. Marshall made yesterday about  
14 the adequacies of these buffer strips in different  
15 environmental situations, and it depends on the particular  
16 situation so the fact that you're leaving a 300-foot  
17 buffer strip doesn't necessarily mean it's going to be  
18 adequate in all cases.

19 MR. HOLLINGWORTH: Well, I  
20 think that the panel agreed with Mr. Marshall that  
21 this was really sort of a general rule which could be  
22 diverted from either way; isn't that right?

23 A Yes, but you were making  
24 a specific out of it.

25 Q Well, that's a recommenda-  
26 tion, sir.

27 THE COMMISSIONER: Well, at any  
28 rate would you agree it's a beginning. It's better to  
29 have it than not to have any buffer strip, is that --

30 A I would agree with that.





Stein, Walker  
Steigenberger, Millen  
CrossExam by Hollingworth

1 MR. HOLLINGWORTH: Q Well, Mr.  
2 Steigenberger, perhaps I could refer to it. It speaks  
3 of a minimum buffer strip except where terrain features  
4 do not permit. Would that be general enough for your  
5 requirements?

6 A That would be similar to  
7 our general recommendations which are a good starting  
8 point, I would agree to that.

9 Q Now, Mr. Stein, going  
10 back to you and the mining of gravel no closer than  
11 300 feet from any active river channel, I assume because  
12 you -- may I rephrase that -- do you mean extracting  
13 gravel from flood plains but staying 300 feet from the  
14 active channel of the river when you make that statement?

15 WITNESS STEIN: I think that's  
16 taken partly out of context. What I said there is that  
17 in my own opinion as a biologist, I would prefer that  
18 there was no gravel extraction, or that it be limited  
19 rather to above the design flood high water stage and  
20 no closer than 300 feet.

21 Q And I suppose not having  
22 studied the Foothills proposal, you're not aware that  
23 it's Foothills proposal not to take any gravel from the  
24 active flood plain, or indeed from any flood plain?

25 THE COMMISSIONER: Well, we're  
26 being told that now, even if you weren't aware of it.  
27 Do you want Mr. Stein to comment on that?

28 MR. HOLLINGWORTH: It's immater-  
29 ial, I assume that he isn't aware.

30 MR. ANTHONY: Perhaps if Mr.



Stein, Walker,  
Steigenberger, Millen  
Cross-Exam by Hollingworth

Hollingworth would like to have the witness comment on the evidence, I think that might be more appropriate than merely saying that he's not aware of it. Perhaps he could relate the information and have the witness comment as to whether he would agree or disagree.

MR. HOLLINGWORTH: I'm sorry, Mr. Anthony, I couldn't hear what you were saying.

THE COMMISSIONER: Well, Mr. Anthony is saying that you're perfectly entitled to say to the witness, "Now Foothills proposes not to take any gravel from the active flood plain anywhere," and to say to him, "Now, do you buy that?"

MR. HOLLINGWORTH:  
Well, I was putting it slightly differently, sir. I was asking if he was aware and assuming he wasn't, and was then going to ask him for his comment after that.

THE COMMISSIONER: Well fine. Well go ahead then.

MR. HOLLINGWORTH: May we follow then: What is your comment on that, sir?

A If indeed that is the case, and it does not change at a future date, fine, I can agree with that.

Q Now on page 10, Mr. Stein, of your evidence, you're speaking of the increase on fishery resources by both sport and commercial fisheries and you indicate that it would be difficult for a gas pipeline company to control fishing by its personnel. I wonder what your feeling would be about a government policy denying fishing rights in certain



Stein, Walker  
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important waters to all people? Do you think that

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would be any easier to enforce?

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Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1                   A     That, sir, I am afraid  
2     is too general for me to answer. I think there are  
3     too many other concerns that have to be taken into  
4     account, especially who is using those resources.  
5     If I could add, as it stands right now, a domestic  
6     fisherman has the right to fish in any waters within  
7     the N.W.T. by any means at any time. I say that there  
8     are these other uses that have to be taken into con-  
9     sideration.

10                  Q     And you are saying that  
11     you can't comment as to whether a general denial of  
12     fishing rights to everybody, not only pipeline personnel  
13     would be any better than just denying the pipeline  
14     personnel?

15                  A     On a specific population?

16                  Q     Yes.

17     On a specific area.

18                  A     In my own opinion I would  
19     say yes, there could be some advantages to that, yes,  
20     but there are many other things that should be taken  
21     into consideration besides my own opinion.

22                  Q     Well, you've got the  
23     statement that government cannot deny the sale of  
24     fishing licences to anyone meeting the criteria of  
25     the Fisheries regulations, but I will take it that  
26     you will agree with me that the regulations can be  
27     changed?

28                  A     The regulations could  
29     be changed, yes, but again, you are having an  
30     effect on many other fisheries, not just any fishing that



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1 may go on in association with a particular pipeline  
2 project.

3 Q Well, I quite realize  
4 that, sir. I just wondered if -- well -- you just  
5 raised a problem of enforcement of a ban on fishing  
6 by pipeline personnel and I ask you whether in your  
7 opinion it wouldn't be easier just to deny it to  
8 everybody, including pipeline personnel. Now, does  
9 it really matter what the --?

10 A No, I don't think that  
11 that is the best answer to the question, or solution  
12 to the problem, sir. You still have a problem of  
13 enforcement involving fisheries officers, limited  
14 staff and a gamut of other things. I think as a  
15 matter of policy I agree with it and I think that  
16 it should be up to the applicant to enforce it as  
17 much as possible.

18 Q Now, in making your  
19 comments on the East of the Franklins Route which  
20 Mr. Marshall discussed with you the day before  
21 yesterday, did you take into account the possibility  
22 of increased human access which could result from  
23 such a route being put through?

24 A Specific to that route?  
25 No, sir, I did not. But as I again point out, this,  
26 I think, is going to be a problem with any pipeline  
27 proposal.

28 Q Well, the present  
29 pipeline proposals are down the Mackenzie River and  
30 I suggest to you that access there is pretty easy



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1 down a good deal of that route, a good deal easier  
2 than the East of the Franklins. Now, do you not agree  
3 that it could be a potential problem to aquatic  
4 resources by increasing the access into the area  
5 behind the Franklin Mountains, east of the Franklins?

6 A Yes, but I say generally  
7 it is going to be a problem with any routing.

8 Q Mr. Millen, on page  
9 2 of your evidence you state that the wharf sites  
10 and staging areas will be long-term operations. I  
11 was wondering what support you have for that statement?

12 WITNESS MILLEN: Well, I  
13 think that that is a reasonable presumption, because  
14 we have heard about the likelihood of looping of the  
15 pipeline and in many cases the construction plan itself  
16 calls for the use of these over -- at least five years,  
17 the initial construction and building up of the  
18 compressor capacity.

19 Q You are speaking of  
20 the Arctic Gas construction plan when you make that  
21 statement, are you?

22 A Yes, that is  
23 A / the construction plan  
24 that I have studied in detail.

25 Q Now, it is the  
26 policy of Foothills that wharves will be dismantled  
27 after the construction of the mainline with the  
28 exception of those wharves in communities that want  
29 them retained. Now, what is your feeling on that?

30 A Well, my experience  
has been that that <sup>in</sup> practice doesn't happen. The





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1 staging areas that I have seen initiated in the valley  
2 have been used repeatedly in most cases.

3 Q Which staging areas, for  
4 which projects?

5 A These are areas that  
6 are initially established often as a seismic staging  
7 area. The seismic areas are surveyed repeatedly by  
8 other companies and for another example, the areas  
9 established for the construction of the C.N.T. line,  
10 the campsites have been used repeatedly by geophysi-  
11 cal survey crews for the various pipeline investi-  
12 gations and the highway and generally speaking it is  
13 my experience that once these sites are established  
14 they get used repeatedly.

15 Q Do you know if it was  
16 proposed originally that those sites be dismantled  
17 after their initial intended use?

18 A Well, in general they  
19 were just abandoned.

20 Q Well, can you answer  
21 my question? Do you know if it was intended to  
22 dismantle those specifically after they were used  
23 for their initial use, or was it planned that they  
24 just be abandoned?

25 THE COMMISSIONER: Or did  
26 they even think about it?

27 A I doubt if they really  
28 thought about it. I think the initial operator normally  
29 considered his own use and removed his facilities and  
30 equipment when he had finished.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1 MR. HOLLINGWORTH: Well, if  
2 you have a situation where it is thought about in  
3 advance and these wharf sites are taken down, possibly  
4 as a result of corporate policy or possibly because of  
5 the government regulation, do you not see a better  
6 result ensuing?

7 A Well, in terms of  
8 protecting the fishery resource, I don't think it would  
9 make any difference, that particular policy, because  
10 the site as cleared and any grading work that was done  
11 would still be there. If it was cleared right up  
12 to the stream as we agree should not be done, the  
13 damage would already have been done and so I think it  
14 is very important to select these sites appropriately-  
15 ly, and lay them out in such a way that even considering  
16 the likely continued future use, the aquatic resource  
17 will be adequately protected.

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Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1 Q I'm not quite sure I  
2 follow you because a minute ago you said that even if  
3 they were dismantled you thought that as far as aquatic  
4 resources went, the damage would be done, and now you're  
5 saying that proper planning should be carried out so that  
6 the aquatic resources are not damaged, even if the  
7 wharves stay there. I don't quite get those two  
8 statements together.

9 A When I say the damage  
10 would be done, I mean the dimensions of the site which  
11 are likely to be used in the future would have then  
12 been determined. That is the fact would be established.

13 Q When you speak of probable  
14 future developm ents in the second part, the sentence  
15 next ensuing after the one about the wharves, are you  
16 just going on your general knowledge of the valley and  
17 what's been occurring?

18 A Yes, I have no specific  
19 knowledge of developments that have failed from everybody  
20 else.

21 Q Now you said you'd had  
22 a chance to look over Foothills application briefly, and  
23 I refer you to page 5 of your evidence. There you've  
24 raised a concern because streams between the Willow Lake  
25 and the Great Bear run open in October. Now, are you  
26 aware that Foothills plans to construct roads in  
27 November and not use them or start construction until  
28 January?

29 A No, I haven't reviewed  
30 the construction plan in that detail of Foothills.





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth  
Cross-Exam by Marshall.  
Q Would that remove the

objection you've raised in this paragraph?

A In the main, yes.

MR. HOLLINGWORTH: O.K., thank  
you, gentlemen.

MR. MARSHALL: Mr. Commissioner,  
one preliminary matter. I've looked at Mr. Don Bissett's  
letter to Dr. Fyles and I gather that not all these  
reports are listed. Two have not been listed. Four are  
in a supplement currently in preparation and we don't  
have that yet. I'd appreciate if those could be made  
available.

CROSS-EXAMINATION BY MR. MARSHALL:

Q Gentlemen, my first ques-  
tion relates to the C.B.C. national news at 9 A.M. this  
morning, and I was wondering whether or not the members  
of the panel had an opportunity to hear that newscast  
and summation of the evidence of the panel within their  
cross-examinations presented in that newscast?

WITNESS STEIGENBERGER: No.

WITNESS STEIN: As I mentioned  
to you before, Mr. Marshall, we got introduction to it  
and then the entire radio system went out, so we don't  
have the details of what we said.

MR. MARSHALL: I don't see Mr.  
Fraser here, Mr. Commissioner. What I would like is a  
copy of the transcript of the newscast, and I'd ask the  
panel members to respond as to whether or not they  
consider the summation given on the national news to



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1  
2 be a fair representation of the evidence that they have  
3 given in chief and in cross-examination.

4 THE COMMISSIONER: Well, Mr.  
5 Marshall, first of all I didn't hear the national news,  
6 and so I haven't been influenced by whatever may have  
7 been said. The second thing is I really don't think that  
8 any objection to the accuracy of Mr. Fraser's broadcast-  
9 ing can be raised at the Inquiry. It has come up  
10 before at community hearings and I ruled it out at  
11 Trout lake, the chief there made a fairly lengthy  
12 statement objecting to Mr. Fraser's reporting of the  
13 views of the Indian people at Fort Liard, he's the  
14 chief of Liard as well as Trout Lake, and don't ask me  
15 to explain why; but I said that's out, and I think it  
16 has to be out here too. I'll hear counsel on it, but  
17 I think if you reflect for a moment, Mr. Marshall, you  
18 will see that we really can't rehash Mr. Fraser's  
19 broadcasts and it's what's said here in this room to  
20 me that matters, and not what goes out over the air  
21 waves, because if we got into the business of determining  
22 whether Mr. Fraser's broadcasts are accurate or not,  
23 we'd be acting as a kind of Board of Censors and wha-  
24 tever else this Inquiry is, it certainly isn't that.

25 MR. MARSHALL: I'm content to  
26 leave the matter, sir.

27 Q I was wondering whether or  
28 not the members of the panel had had an opportunity to  
29 read the transcripts of the evidence given by Dr. McCart  
30 before this Inquiry pertaining to Phases 2 and 3,



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1  
2 including both the direct evidence and the cross-examina-  
3 tion. Mr. Millen?

4 WITNESS MILLEN: I have read  
5 through quite a bit of that, but I don't believe I've  
6 read it all.

7 Q Mr. Steigenberger?

8 WITNESS STEIGENBERGER: I read  
9 the presentation and the cross-examination for Phase 3,  
10 I guess; but I'm not too aware of what actually went  
11 on in Phase 2.

12 Q There was quite a bit  
13 dealing with gravel, gravel mining, impact on fishes,  
14 of such operation; water availability along the North  
15 Slope. I take it you haven't read the evidence before  
16 the Inquiry on those subjects?

17 A I would say that that  
18 was a fair assessment, but the recommendation that  
19 were made are basically general and I don't entirely  
20 agree with the availability of water in some instances,  
21 specifically groundwater sources. It's an opinion.

22 MR. ANTHONY: Well, I suggest,  
23 Mr. Commissioner, that<sup>if</sup> Mr. Marshall has facts that he  
24 wishes to put to this panel, whether they come out in  
25 reports or evidence in cross-examination, that he put  
26 the facts and get the panel's opinion. As you know, the  
27 arrangement with the Governm ent of Canada is that while  
28 these panelists have spent a great deal of their own  
29 time to review material and to prepare evidence for  
30 this Inquiry, we are not in a position to require them





Stein, Walker  
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Cross-Exam by Marshall

1 to use government time to review the evidence of this  
2 Inquiry, and I am very thankful for the work that this  
3 panel and all the government witnesses have done, utiliz-  
4 ing their own time to prepare for this Inquiry, and I'm  
5 sure that so much has happened that it's impossible for  
6 them to follow everything. But I would think that the  
7 panel would be prepared to respond to specific fact  
8 situations or opinions and give their views on it.

9 THE COMMISSIONER: It seems to  
10 me that your point's a good one, but the Minister of  
11 the Environment, then Madam Sauve', promised the Inquiry  
12 her full co-operation and we have had it, and I would  
13 think that any legitimate request by Mr. Marshall to  
14 the witnesses to examine this or that, is one that  
15 Commission counsel could ensure they were able to do  
16 on government time. This is important. This is as  
17 important -- forgive me, it may be as important as  
18 anything else the Departm ent is involved in. Doesn't  
19 that make sense, Mr. Ryder?

20 MR. MARSHALL: Sir, I didn't  
21 even ask that they go that far. I just wanted to know  
22 whether or not they had read all the evidence pertaining  
23 to the subjects on which they have been giving evidence.  
24 I just wanted to know what their information base was.

25 THE COMMISSIONER: Oh, all right.

26 MR. MARSHALL: That's really  
27 the only point.

28 MR. RYDER: I don't think we've  
29 arrived at that critical area just yet, Mr. Commissioner.  
30 I understood Mr. Marshall could then go on to ask the



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1  
2 panel with respect to specific observations that Mr.  
3 McCart or Dr. McCart had made.

4 THE COMMISSIONER: Sure, well  
5 go ahead, Mr. Marshall.

6 M R MARSHALL: Q Mr. Walker,  
7 how about you?

8 WITNESS WALKER: I have read  
9 Dr. McCart's evidence and a small part of the cross-  
10 examination but I cannot identify at this time what  
11 part of the cross-examination I read.

12 Q Would that be Dr. McCart's  
13 evidence pertaining to Phase 3 the impact on living  
14 environment?

15 A Yes sir.

16 Q He was, as you were  
17 apparently not aware, a witness as well on the previous  
18 phase dealing with the impact on the physical environment  
19 and dealing with such matters as water availability and  
20 so on. You didn't read that part of his evidence?

21 A No sir, I did not.

22 Q Mr. Stein, how about you?  
23  
24  
25  
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Stein, Walker  
Steigenberger, Millen  
Cross- Exam by Marshall

WITNESS STEIN: I read the evidence in chief and the testimony in part.

Q I see. Mr. Walker, on page 3 of your evidence you list the Fisheries Service program objective as initially outlined July '71, quote:

"To protect the productivity level of the ecosystem as measured in 1971 and 1972 in areas as it may be affected by the construction and operation of gas and/or oil pipelines."

I take it those are your terms of reference for the very extensive work done by the Fisheries Service?

WITNESS WALKER: That is the overall objective which I came up with.

Q And then you listed then four sub-objectives that you listed on page 3?

A That is correct.

Q And I think it would be useful if I just have those gone over once again to make sure that we understand the framework within which you were carrying on your studies. The first, you say, is to inventory the indigenous and migratory fish stocks qualitatively and quantitatively and was that done, sir?

A Yes, sir, that is looking at the biology of the resource.

Q The second, to measure some characteristics of the aquatic environment relevant to the fisheries resources, and that was done





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 as well, was it, sir?

2 A That is the physical  
3 aspects.

4 Q Yes. Thirdly, to iden-  
5 tify factors in connection with pipeline construction  
6 or operation which may bring about environmental  
7 change detrimental to the fishery resources, and that  
8 has been done as well, sir, in this program?

9 A That is correct.

10 Q Finally, fourth, to  
11 recommend measures that will prevent degradation of  
12 the environment during construction and operation of  
13 the pipeline, that was done as well, sir, was it?

14 A Precautions and  
15 guidelines, yes.

16 Q And you mentioned that  
17 the program related both to the north Yukon and  
18 to the Mackenzie River valley, your comments then  
19 that you have made would apply to both those areas,  
20 would they?

21 A No, these objectives  
22 were set for the north Yukon only, prime route and  
23 interior.

24 Q Yes, Mr. Stein, were  
25 there similar objectives then for your area of interest,  
26 the Mackenzie River valley?

27 WITNESS STEIN: The objectives  
28 of ours were in my testimony. Overall I would say  
29 that they are reasonably similar.

30 Q Yes, and overall are you



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 satisfied that the programs carried out achieved the  
2 objectives set out when the program was established?

3 A No, sir, I believe we  
4 have already gone over this in yesterday's session  
5 that I am not happy with the information that is  
6 available right now on fish habitat in most systems.

7 Q You mentioned that there are a number of programs that  
8 are currently under way. You detailed those for me  
9 in your evidence listed them and made reference to the  
10 reports that would be produced. In your opinion, are  
11 there other programs that are required in addition  
12 to those currently being undertaken by the Fisheries  
13 Service in your region of interest?

14 A For the assessment of  
15 the pipeline application?

16 Q Yes.

17 A I think again I presented  
18 a very quick list of additional studies that I felt  
19 should be done. I did not specify that it be done by  
20 Fisheries and Marine Service.

21 Q I see. I am to take  
22 it then that that list you gave was of things that  
23 are not being studied by the Fisheries Service, but  
24 in your judgment ought to be studied in order that  
25 an assessment of the pipeline could be made?

26 A I would have to find that  
27 list, Mr. Marshall, but I think I can say that although  
28 there may be some work done that would fall under those  
29 topics, that there would be little of it that would  
30 apply specifically to the pipeline application.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 Q I am not sure that  
2 I follow that.

3 A We have some studies that  
4 are going on such as the highway monitoring study. They  
5 will be intensive studies on three minor tributaries.  
6 That information would be applicable to the pipeline  
7 project. Although we, as I say, I haven't got that  
8 list, I don't know if I can find it, but there may be  
9 some areas that we are doing similar type of work in  
10 but I cannot recall that any of it would relate  
11 specifically to the pipeline.

12 Q Perhaps we can come back  
13 to that later after you have had a chance to look  
14 at the transcript. I haven't had a chance to examine  
15 last night's transcript yet.

16 Mr. Walker, can you give  
17 some indication of the amount of moneys that were  
18 expended in carrying out these fisheries programs in  
19 your area?

20 WITNESS WALKER: The Pacific  
21 region?

22 Q Yes.

23 A Approximately three-  
24 quarters of a million dollars.

25 Q Mr. Stein, could you  
26 give me some indication of the amount of moneys that  
27 were spent by the Fisheries Service in carrying out  
28 the studies that you have indicated were done over  
29 this four year period?

30 WITNESS STEIN: The total





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

cost for our pipeline project?

Q Yes.

A I would guess that it would be slightly over a million dollars.

Q Yes. Now, Mr. Walker, we are dealing specifically with your objectives, and would it be fair to say that those objectives have been met by the time the program was completed in March of 1975?

WITNESS WALKER: These programs these objectives were met to a degree by at the time that we ceased field studies which was early 1974. We had -- so we have had -- we have spent a year plus, writing and publishing information, and in doing that, of course, you recognize gaps in knowledge and that, so it is a matter of degree.

Q Yes, sir, I think every scientist who has been before the Inquiry has indicated that it is always nice to have more studies and more research and more information, so we are familiar with that concept. Would it be fair to say, Mr. Walker, that this fairly extensive work that Fisheries Service did, together with the results of other studies done by the applicant and others who are available to the Fisheries Service was sufficient to enable Fisheries Service to make a preliminary environmental impact assessment of the impact of the proposed Arctic Gas pipeline on aquatic resources within the north Yukon?

A In part, yes, mm-hmm.

Q Now, I appreciate that



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 there are areas where some additional studies have  
2 to be done and reference has been made in the evidence  
3 of the panel members to the requirement for site  
4 specific assessment of various operations and crossings  
5 and areas for water withdrawal and areas of gravel  
6 mining operations; I appreciate that. Recognizing that,  
7 sir, did you satisfy yourself that within your area  
8 of interest it was possible for the line to be built in  
9 such a manner that the impacts on aquatic resources  
10 could be kept within acceptable limits?

11 A With the provisions that  
12 were discussed yesterday, yes.

13 Q Namely the two that I  
14 have just outlined, that there would have to be  
15 completion of some studies to fill in the knowledge  
16 gaps and there would be a requirement for site specific  
17 assessment?

18 A Yes, sir.

19 Q Mr. Stein, I was wondering  
20 whether the same would apply with respect to the  
21 Fishery Service work in the Mackenzie River system.  
22 Do you feel that provided that there is site specific  
23 assessment of the particular things that I mentioned;  
24 crossing locations and borrow areas and water withdrawal  
25 areas, and that there is an opportunity to complete  
26 the knowledge gaps, fill in the knowledge gaps, either  
27 through work by the government or work done by consult-  
28 ants to Arctic Gas, that you are satisfied that the  
29 line could be built through the Mackenzie River Valley  
30 without unacceptable impacts on the aquatic resources?



1 You have got enough knowledge now to make that  
2 sort of a statement provided those things are done?

3 MR. RYDER: I am sorry,  
4 Mr. Marshall, I can't hear your question.

5 THE COMMISSIONER: You are  
6 not speaking into the microphone.

7 MR. MARSHALL: I am sorry, I  
8 will go back over that.

9 Q Mr. Stein, the point I  
10 am getting to is this, whether or not you are in a  
11 position now to know whether a pipeline can be built  
12 along the Mackenzie River Valley without an unacceptable  
13 impact on aquatic resources. Now, I am drawing a  
14 distinction between a preliminary impact assessment  
15 if you like, one that might reach the conclusion that ,  
16 yes, it could be done provided these steps are taken,  
17 and a final environmental impact assessment, if you  
18 like which says, we know on a site specific basis  
19 everything that is going to be done and how it is  
20 going to be done and we have looked at all the  
21 crossing plans and so on. So what I am directing  
22 your attention to is the preliminary environmental  
23 impact assessment aspect of it, are you with me to  
24 this point?





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 WITNESS STEIN: I think so.

2 Q What I want to know, Mr.  
3 Stein, is whether or not the Fisheries Service in your  
4 judgment, based on the work that's been done by the  
5 Service and based on the work that's been done by  
6 Aquatic Environme nts and others, at this point in  
7 time feels that it's got enough information to be able  
8 to assess, in a preliminary way, environmental impacts on  
9 fish resources in the Mackenzie Valley, of the construc-  
10 tion of a gas pipeline.

11 A I think I would have to  
12 say for a very preliminary assessment, yes, in my own  
13 opinion I ~~would~~ be satisfied. However, you also made  
14 comment, I think, in your previous statement on the  
15 question about obtaining additional site specific infor-  
16 mation and the type of things that I have outlined are  
17 not necessarily site specific, such as habitat analysis  
18 again. I do not -- I would feel actually that there is  
19 probably a fair amount of data existing, site specific.  
20 I want to know exactly what is downstream that may  
21 potentially be affected, and I would like the answers  
22 to several of the additional questions I presented con-  
23 cerning such things as toxocology, stream flows, fish  
24 passage / <sup>with</sup> increased velocities, etc. If that information  
25 -- if I was guaranteed that this information would be  
26 available prior to or at least at preliminary design,  
27 then I would be satisfied with making a statement such  
28 as that concerning a preliminary assessment.

29 Q I want to review a number  
30 of these specifics with you later in the morning, and



Stein, Walker  
Steigenberger, Millen  
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1  
2 I'll get back to that.

3 MR. ANTHONY: Mr. Marshall,  
4 I believe Mr. Walker wanted to respond further, if  
5 you'd be interested in hearing further from him.

6 THE COMMISSIONER: Go ahead,  
7 Mr. Marshall.

8 MR. MARSHALL: Yes, Mr.  
9 Walker.

10 WITNESS WALKER: You are asking  
11 the question on the basis of a single line?

12 Q Yes.

13 A Within the framework of  
14 the construction schedule given some time ago, that is  
15 winter construction, with some summer staging and support  
16 activity.

17 Q Yes.

18 A Then my answer remains  
19 as given.

20 WITNESS MILLEN: I'd like to  
21 point out two items that I suggested yesterday required  
22 further study, they are both general items that we  
23 have been asked to take -- these things can be done  
24 and that is the protection of slopes from erosion, and  
25 the other one, the passage of sub-surface flows past  
26 your chilled pipeline in stream beds have not been  
27 demonstrated to my satisfaction, and I believe these  
28 are quite general things which still require to be done.

29 Q If I can just go back on  
30 that with you. Your concerns relate to erosion control



Stein, Walker  
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Cross-Exam by Marshall

1 measures --

2 A Yes.

3 Q -- firstly, and secondly,  
4 the effect that a frost bulb around a pipeline would  
5 have on water flow.

6 A Yes, specifically in  
7 streams.

8 Q Sir, have you reviewed  
9 the evidence that's been given before this Inquiry on  
10 those subjects?

11 A Yes, I have.

12 Q And with respect to  
13 erosion control measures, what concern do you have at  
14 the moment?

15 A The techniques proposed,  
16 sir, have not been demonstrated to my satisfaction

17 Q You're thinking in terms  
18 of the need for a field trial?

19 A Yes, I believe that is  
20 actually the case under the circumstances.

21 Q My general understanding  
22 is that in large measure the erosion control techniques  
23 don't differ that much than those that you say would  
24 be in highway construction.

25 A Yes, I'm not at all  
26 satisfied with the techniques that have been used so  
27 far on the highway construction in the north.

28 THE COMMISSIONER: Excuse me,  
29 you mean the Mackenzie?

30 A In the Mackenzie Highway,





Stein, Walker  
Steigenberger, Millen  
C ross-Exam by Marshall

1 yes, in the valley.

2 Q In the valley. Are you  
3 doing an assessment of the adequacy of those techniques  
4 that will in due course find its way into a report?

5 A I'm not now involved with  
6 that/work, no.

7 Q Looking at your area of  
8 responsibility, I would gather that if it fell within  
9 anyone's area of responsibility, it would be within yours.

10 A Yes, it certainly did,  
11 up until the time I moved to Vancouver this summer.

12 Q Well, might it not be of  
13 considerable assistance to those planning pipeline  
14 construction to have available the benefit of your  
15 observations on the adequacy or otherwise of erosion  
16 control measures employed on the highway?

17 A Yes, I'm afraid it would  
18 have been, but I'm not doing that work now.

19 Q Do you know if anybody else  
20 is doing it?

21 A No, I'm not aware of  
22 any work.

23 MR. ANTHONY: Sorry, now that  
24 you've raised the subject I think Mr. Stein wishes to  
25 also make a further comment.

26 MR. MARSHALL: Mr. Stein?

27 WITNESS STEIN: Yes, I would  
28 just like to further qualify my response to that.  
29 That is, I believe you said that would be a combination  
30 of the applicant's data and Fisheries & Marine Service



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 data. I would just like to point out that we have  
2 not done a full compilation yet between or on the  
3 new alignment changes, that being the delta routing  
4 and the Simpson re-routing, so there may be some gaps  
5 in there. I want to point that out, I think, probably it's  
6 similar to what we have for the rest of the line.

7 Q Mr. Stein, you mentioned  
8 the other day that there were some monitoring programs  
9 being set up, three in number, relating to the Mackenzie  
10 Highway, and I was wondering whether or not those  
11 would include an in-depth monitoring of erosion control  
12 measures?

13 A Not of erosion control  
14 measures, no. That was not part of the program. If I  
15 could add to that, if such circumstances did develop  
16 whereas we were faced with erosion problems, we would  
17 probably make recommendations as to how they might be  
18 rectified. I would not say we would do a detailed  
19 assessment of individual techniques.

20 Q Well, I understood from  
21 the evidence of the panel that it was being suggested  
22 that there ought to be a submission of all of the cross-  
23 ings proposed by either pipeline, I think some 600  
24 in number, together with detailed erosion control and  
25 so on. Am I to take it that that's not being done  
26 for the highway?

27 A To my knowledge, yes, it  
28 is being done on an individual stream basis on the  
29 highway. Perhaps Mr. Millen would wish to comment a  
30 little more on that.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1  
2 Q I'd like to leave that for  
3 a few minutes. I've got that in my questions for you, Mr.  
4 Millen, and I'll get back to that.

5 Now, Mr. Walker, Mr. Bayly  
6 asked you about knowledge gaps and you and your colleagues  
7 have outlined some, some of which may be covered by  
8 Fisheries Service programs and indeed some of which  
9 Arctic Gas presently has under examination. Dr. McCart's  
10 given some evidence about that. You've indicated a  
11 one to three-year period being required to complete  
12 this work. Sir, would it be fair to say that with com-  
13 -pletion of these programs, together with detailed site  
14 specific analysis, such things as crossing locations  
15 and borrow removal areas from water sources, you would  
16 be in a position to make a detailed environmental  
17 impact assessment on fish.

18 WITNESS WALKER: Yes, with  
19 details of alignment from the applicant and given that  
20 time frame for study, we'd have -- we could zero in on  
21 certain factors and collect additional information.

22 Q Would you agree with me,  
23 Mr. Walker, that the Arctic Gas Fisheries Research  
24 represents really an unparalleled scale of research on  
25 aquatic resources funded by industry for any industrial  
26 project in this country?

27 MR. ANTHONY : Perhaps we could  
28 find out whether the witness is familiar with all of the  
29 research done in this country.

30 THE COMMISSIONER: Well no,





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

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let Mr. Walker give us the advantage of his views.

A It is the largest industry-sponsored project that I have been involved with, environmental project that I've been involved with in my time.

MR. MARSHALL: Q I understand, sir, that this scale of analysis has seldom if ever been done even on a government project. Is that correct, to your knowledge?

A Well, within the particular area of study, yes.

THE COMMISSIONER: Excuse me, what do you mean by that?

A Geographic.

Q You mean here in the north, Mackenzie Valley and the North Coast?

A Well, within the Pacific Region jurisdiction, that would be Northern British Columbia-Yukon Territory.

THE COMMISSIONER: Oh, oh.

A The monies spent in research, exceeded, for the pipeline, exceeded those spent in regular funds.

Q What do you mean "spent"? Exceeded what the government spent in the Northern Yukon -- just leave British Columbia out of it --

A Yes.

Q -- in examining the likely impact of this pipeline project. Is that what you're



Stein, Walker  
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Cross-Exam by Marshall

1  
2 saying?

3 A That's what I meant, Mr.  
4 Commissioner.

5 MR. MARSHALL: Q Mr. Stein,  
6 would basically the same apply in your area of interest  
7 in the Mackenzie Valley? This is really an unprecedented  
8 level of  
9 research on aquatic resources.

10 WITNESS STEIN: Within the  
11 Mackenzie Valley, yes, to my knowledge.

12 THE COMMISSIONER: And to follow  
13 up on that, did Arctic Gas spend more money examining  
14 the likely impact of the pipeline and accumulate more  
15 baseline data in that connection than the government  
16 did in the Mackenzie Valley if you know?  
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Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 A I would be very  
2 reluctant to answer that. I think we have prepared  
3 pretty significant amounts of information in the  
4 valley alone.

5 THE COMMISSIONER: Well, that  
6 ties in, I think, with what Dr. McCart --

7 A Again I might add that  
8 we were a four year project and I understand that Mr.  
9 McCart is still carrying out studies, so it may indeed  
10 be that there is additional material that may make a  
11 difference.

12 MR. MARSHALL: Well, just to  
13 summarize on this point, both in the North Yukon and  
14 in the Mackenzie Valley, the combined, and in effect  
15 a kind of complementary programs that were undertaken  
16 by government and industry were really unprecedented  
17 in scale? In the north?

18 A Within my experience,  
19 yes.

20 Q Now, given that this  
21 extensive work has been done, and given what you at  
22 the Fisheries Service know about the route location from  
23 the alignment sheets, the construction procedures and  
24 the scheduling and so on, and assuming that the know-  
25 ledge gaps that you have identified can be filled  
26 by government, in co-operation with the Applicant, as  
27 we proceed towards final design, and assuming further  
that adequate terms and conditions for the protection  
of aquatic resources are incorporated into the grant  
of a right-of-way by the department; then, Mr. Walker,





Stein, Walker  
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Cross-Exam by Marshall

in your opinion, can the Fisheries Service, provided it gets proper funding, properly monitor and inspect the gas pipeline activity so as to assure that aquatic resources are adequately protected?

WITNESS WALKER: Monitor and inspect -- I would say, Mr. Marshall, it would be in a much better position than we are now to monitor and inspect.

THE COMMISSIONER: I wonder if you wouldn't mind asking that question again --

MR. MARSHALL: I will go back through the preamble because I had some givens and some assumptions in it.

Q Given the extensive work that has been done, and we have just discussed that in detail; given what you at the Fisheries Service know about specifics of route and construction procedures and scheduling and so on <sup>as</sup> set out in these applications; assuming two things: one, that knowledge gaps that you have identified can be filled by government or the applicants as we proceed to final design; and assume secondly that adequate terms and conditions for the protection of aquatic resources will be incorporated in a grant of any right-of-way; those two assumptions, those two givens; then, Mr. Walker, would it be your opinion that the Fisheries Service, provided it gets proper funding, can properly monitor and inspect the gas pipeline activities so as to ensure that aquatic resources are adequately protected?

A I would think so.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

However, given those assumptions you mentioned, I could see that we would be in an excellent position to make an assessment of the pipeline, to which we were addressing ourselves to previously. Now, monitoring and inspecting brings in an area which is outside -- may be outside of my responsibility. It's into possibly legislation, enforcement, etc., but there will be some technical input into that system.

THE COMMISSIONER: Well, Mr. Walker, without getting into the question of whose responsibility it will be to enforce any terms and conditions that are laid down; leaving that out, what Mr. Marshall is saying to you, as I understand it is this: he says that you have indicated that there were some areas where your knowledge of the fishery was not complete. If it were possible to find out what you had to know about those particular areas where your knowledge is incomplete, if you could do that as Arctic Gas moves to final design; then given all the work that they have done and you have done; given the appropriate terms and conditions which you and your colleagues have outlined for us; could they go ahead and build this and given adequate inspection and enforcement, would the fishery be protected? That seems to be what we are driving at. I have failed, have I?

MR. MARSHALL: No, sir, you haven't. I think I honed in a little more on the Fisheries Service --

THE COMMISSIONER: All right,



Stein, Walker  
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well, you carry on then --

MR. MARSHALL: I was given all of that preamble, I was wondering whether or not the Fisheries Service, assuming that they got proper funding, could get the job done, that is, could they monitor and inspect the pipeline activities so as to ensure that aquatic resources were adequately protected, do they have the capability.

THE COMMISSIONER: Oh, I see. Well, that is fine. I would like to hear about that too, then.

A Mr. Commissioner, maybe I am belaying a point, but I don't know as I can speak for the Fisheries Service in monitoring. I can in regards to making a technical assessment of the pipeline application and also in having technical input, in advising to whatever structure, if a body is set up to guide the monitoring activities. Maybe I am just hung up on this monitoring, surveillance, but as a --I don't know what -- I would say that insofar as fishery matters are concerned and as a biologist, we could have an effective input into the application and also into the monitoring surveillance.

THE COMMISSIONER: Mr. Stein, you wanted to add something. Is it all right if Mr. Stein throws his two cents worth in now?

MR. MARSHALL: Sure, by all means, sir.

WITNESS STEIN: I suspect it was probably going to be directed to me next, anyway --





Stein, Walker  
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MR. MARSHALL: You are right.

A I would say, sir, that -- without rehashing too much -- given all that we could ask for and the additional manpower and funds to carry it out, I think we would be in as good as shape as we are likely to be, with one other proviso on here, I think; that the procedures and techniques do not change even after final design, and perhaps more important here is going to be timing. If that construction timing changes significantly, then we have got a whole new ball game.

THE COMMISSSIONER: What do you mean timing? Timing of the winter season proposal, or what?

A I mean, Mr. Commissioner, if we were forced into the situation where we end up with summer construction rather than winter.

THE COMMISSIONER: All right. Maybe we could stop for coffee and ponder that answer.  
(PROCEEDINGS ADJOURNED FOR A FEW MINUTES)



Stein, Walker  
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(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. MARSHALL: I guess were  
ready to proceed, sir.

MR. ANTHONY: Mr. Commissioner,  
Mr. Walker wanted to make a further statement in response  
to Mr. Marshall's question before the coffee, and  
before Mr. Marshall carries on with other things.

THE COMMISSIONER: Yes, Mr.  
Walker.

WITNESS WALKER: In reference  
to the question put to us immediately prior to  
the coffee break, I would say that I am unable to  
answer for the Fisheries Service. However, within the  
Service there would be adequate technical information  
on which to base an intelligent recommendations, which,  
if followed through by whatever agencies or agency or  
authority is constructed or designed for monitoring  
surveillance, that these recommendations be followed  
through, well then I can answer your question "yes".

MR. MARSHALL: Or I suppose  
another way of putting it would be to ask you whether  
the Fisheries Service, with proper funding and given  
the responsibility to do so, could properly monitor and  
inspect the gas pipeline activities so as to ensure  
that aquatic resources are adequately protected.  
I add that phrase; does it help?

A Well here again you're  
having us speak for the service, and we're in a technical  
position. So once again I must answer that on a tech-  
nical basis we could accomplish that job.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

Q Have you got your hand  
up, Mr. Stein?

WITNESS STEIN: Yes, and I don't  
have to leave the room. I just wanted to add here  
something that's actually similar or along the same  
lines as what Mr. Walker has just said. I was approach-  
ing your question, Mr. Marshall, from a data base point  
of view, and in my mind, as I said, given what we have  
asked for, we would be in good shape.

I also want to point out that  
the responsibilities of my group are to do impact  
assessment work. We are not involved in the enforcement  
aspects of Fisheries & Marine Service, and this is  
operated from our Yellowknife Office as far as the  
N.W.T. is concerned.

Q It's a different branch  
of the Fisheries Service, is that right?

A That is correct, so I  
think, you know, there should be some additional input  
in there. I think regardless of who has the overall  
responsibility of monitoring surveillance and so forth,  
what I was getting at here is that whoever that indivi-  
dual or individuals may be, that with all of the things  
given that we have both gone through, that person should  
be in a position to make a final design assessment.

Q I believe the only one  
who hasn't had a chance to answer is Mr. Steigenberger  
to express what his views on the subject are.

WITNESS STEIGENBERGER: Just a  
general comment regarding this. There is a continual





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 reference to the Fisheries Service per se in all the  
2 questions and I think it goes one step beyond that, in  
3 that you have legislative Acts within the Territories  
4 that apply, and the Fisheries Act, Inland Waters &  
5 Navigation Act, and one on the Prevention of Pollution  
6 in the Arctic Sea, and then we have land use and etc.,  
7 and I feel that it should be a multi-disciplinary  
8 authority where all technical input is evaluated and  
9 put forth so I don't think you can direct questions  
10 has Fisheries Service -- does Fisheries Service have  
11 the capability to evaluate prior to final design?  
12 I think it's beyond individual services, and I think  
13 yesterday in Mr. Walker's testimony he outlined a require-  
14 ment that some larger authority be established with some  
15 permanency to evaluate the recommendations so that it's  
16 -- it encompasses all disciplines.

17 Q What you're suggesting then  
18 is you can't look at a Fisheries Service in isolation  
19 but perhaps operating as part of a larger control  
20 authority.

21 A Multi-disciplinary authority,  
22 yes.

23 Q Mr. Millen, just on that  
24 point, would you, sir, as an engineer, see wisdom in  
25 there being a single control authority rather than a  
26 multiplicity of authorities?

27 WITNESS MILLEN: Yes, I can  
28 see the advantage in that.

29 Q From an engineering point  
30 of view, you'd agree that having a variety of control



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 agencies operating independent one from the other could  
2 lead to engineering planning nightmares.

3 A Yes, I also think there  
4 will be a need for the aspects of the environment  
5 protection to consult with each other so that they  
6 are not interfering with each other's resource.

7 Q Now, Mr. Stein, we  
8 talked a bit two days ago about sedimentation studies,  
9 and I was wondering whether or not you were familiar  
10 with the work on sedimentation of Aquatic Environments  
11 that's reported in Volume 15 of the Biological Report  
12 series, in Chapter 4?

13 WITNESS STEIN: I think I res-  
14 ponded to that that I was not familiar with it.

15 Q I want to ask you amore  
16 general question and in order to do that I'm going to  
17 give you a little bit of information as to the nature of  
18 the study that was undertaken so that you can respond  
19 to subsequent questions.

20 My information is that this  
21 study done on Miner Creek on the west bank of the  
22 Mackenzie between Norman Wells and Sans Sault Rapids  
23 was of sedimentation caused from a seismic line, and  
24 there was rather extensive and chronic sedimentation  
25 into the creek from this line. The purpose of the work  
26 was to make an assessment of the extent to which sedi-  
27 mentation effects could be measured downstream,  
28 specifically they were studying the effects on benthic  
29 invertebrates.

30 Now, this study is in the



Stein, Walker  
 Steigenberger, Millen  
 Cross-Exam by Marshall

Biological Report series, which were filed as Exhibit 350, and I understand that the findings in that study were that the mean numbers of organisms had recovered to upstream levels within one or 200 meters downstream from the line. Now I give you that as background information, sir, to lead to this question: Do you know of any similar types of sedimentation studies that have been carried out?

A I think as I pointed out in my additional comments after lunch yesterday that there has been sedimentation work undertaken by Doctors Snow & Rosenberg from the Freshwater Institute. They were laid out along similar lines, I would say. In other words the Harris Creek work, as I recall, was done on a controlled sediment level; measurements of drift were taken at given distances downstream from the control site. As I think I again said, I am not aware that they attempted to follow the downstream effect to its end point, if I can put it that way.

Q Would you have been aware of the evidence given before this Inquiry that Dr. McCart's company is involved in this type of studies in connection with Inland Gas Pipeline in South-eastern British Columbia?

A I am not aware of that, no sir.

Q Sir, Mr. Stein again at page 18 of your evidence, you make this statement:

"Nor to my knowledge has consideration or study





Stern, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1        been directed to determining what synergistic  
2        effects might result from subsequent developments  
3        such as crossing by another pipeline, a highway,  
4        possibly even a railway or hydro-electric trans-  
5        mission line.."

6 Have you found that passage, sir?

7 A Yes.

8 Q I believe you mentioned  
9 in your cross-examination yesterday that your instruc-  
10 tions were to consider both the west and east sides of  
11 the river, and an oil line and a gas line. Is that  
12 right?

13 A That's correct.

14 Q What about a highway?

15 A Under the terms of  
16 reference of our program, no.

17 Q Well, sir, in carrying  
18 out the studies that have been conducted, did you study  
19 cumulative or synergistic effects of the facilities in  
20 a transportation corridor; say an oil pipeline plus  
21 a gas pipeline?

22 A Concerning sedimentation?

23 Q Well, with respect to  
24 any aspect of impact on aquatic resources.

25 A No, we did not.

26 Q It would follow then that  
27 if you haven't done it for an oil-gas line in -- an  
28 oil line and a gas line, you haven't done it for those  
29 two plus a highway either.

30 A That is correct, yes.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1  
2 Q You've given some evidence  
3 about sensitive streams, sir. You recommend in your  
4 evidence, beginning at page 12, that these be avoided.  
5 Would these same streams be sensitive in connection  
6 with highway construction as well as gas pipeline  
7 construction?



Stein, Walker,  
Steigenberger, Millen  
Cross-Exam by Marshall

A Yes, sir, I would .

Q Well, then have you given special recommendations to the D.P.W. designed to protect those sensitive streams?

A I am just trying to recall offhand which of those sensitive streams the highway has crossed. We have made specific recommendations concerning crossings for every stream crossing.

Q Well, I was thinking for example of River Between Two Mountains, or the Willowlake River.

A Our concerns here were considerably less since, if memory serves me correctly, these were both bridge crossings.

Q I see. I wonder, sir, if it might be possible to obtain copies of the recommendations that have been given by your service with respect to the stream crossings affected by the highway?

A YOU are referring here to the highway guidelines?

Q Well, you have indicated that you have made recommendations with respect to all stream crossings that would be affected by the highway?

A That is correct.

Q I wonder if we might be able to obtain those.

A Where recommendations were needed, yes.





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

Q Now, are those recommendations contained in reports, or are those simply memoranda that are given to the D.P.W.?

A Our recommendations -- the way the highway design is working at this time, highway design sections covering a few miles normally, are submitted to our Service via the Mackenzie Highway working group. Our engineers and biologists then review these packages, make their comments, note what concerns they may have on specific river crossings, make recommendations as to additional approaches or changes in design. These comments are then submitted back to the Mackenzie Highway environmental working group. There is no volume, to my knowledge that contains all these recommendations.

Q Well, I am sure that it is apparent to you, sir, that this type of recommendation, that's stream specific would be of interest to a pipeline company wanting to cross those same streams. I was wondering whether or not those recommendations or comments might be made available? Do you know whether that could be done?

A I am afraid, sir, that that would have to be done through the Mackenzie Highway working group, I think.

Q I see. Perhaps we could follow up with Commission Counsel on that, sir.

Dr. Wilimovsky and Dr. McCart have both indicated their views that a highway would have perhaps six to ten times more impact



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

on aquatic resources than a gas pipeline. Mr. Steigenberger, I believe that you have made reference to Dr. Wilimovsky's evidence on this point the other day. Do you agree with that?

WITNESS STEIGENBERGER: I just, you know, read part of that transcript and you have to accept the fact that he is a competent biologist. Accepting that fact then it is reasonable to assume that he is somewhere near being right.

Q I see. I realize that it is kind of a ballpark estimate. I was wondering, Mr. Stein, if you had any opinion on that subject?

WITNESS STEIN: I would like, Mr. Marshall, to see that comment made much more specific. Again, the guidelines and recommendations that I have included in my testimony in many cases would be equally applicable to a highway, I think, as they would be to a pipeline. Now, here I am talking things like water extraction and gravel removal. If you want to discuss it from the point of view of quantities of gravel needed, then I think that we are talking a different question and, you know, it may partially be true and in some circumstances it is not, in my opinion.

Q I don't think that it was presented in a more specific way than that. It was just a general comment. I am content to leave at that with you.

Mr. Walker, about the Fairbanks Corridor, Dr. McCart said in his evidence that he would



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 prefer a Fairbanks Corridor, but only if Alaskan gas  
2 only was being transported to markets, but that if  
3 Delta gas was also to be transported to markets and  
4 there/are, I think, two possibilities have been  
5 discussed in the sense of a line that would go, as you  
6 can see on the map behind you, from the Delta area  
7 down along the routing of the Dempster and so on or  
8 a line up the Mackenzie. That he would then prefer  
9 the Prime Route as having the least overall impact  
10 on aquatic resources. In other words, he is saying  
11 that he would prefer a Fairbanks Corridor too, if  
12 we are only talking about taking gas from Prudhoe Bay  
13 and we are not taking any gas from the Delta, do  
14 you follow me? I was wondering, sir, whether or not  
15 that is your opinion as well, whether in making your  
16 comment about the Fairbanks Corridor you are also  
17 taking into account this delivery line from the  
18 Mackenzie Delta?

19 THE COMMISSIONER: If you  
20 add on that delivery lateral, supply leg from the  
21 Delta along the Dempster to Whitehorse, then if you  
22 look there you will see that -- yes. If you add in  
23 that leg, then what do you think of the Fairbanks Route  
24 as compared to the Prime Route ?

25 WITNESS WALKER: In making  
26 my assessment I did not think in terms of feeder lines  
27 joining the Fairbanks Route. From what I have read  
28 or heard, it seems feasible to take gas down the  
29 Mackenzie River and any resources may be fed into that  
30 line and, in other words, feeder lines were not a part





Stein, Walker  
Steigenberger, Millen  
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of my consideration, thinking that the resources could be taken out by some other way.

MR. MARSHALL: Well, as the Fairbanks Corridor was put forward by Arctic Gas in its alternative corridors evidence, there were two components to it. There was a supply line from Prudhoe Bay and a supply line from the Mackenzie Delta that join in the central part of the Yukon, and that was the Fairbanks corridor as defined by that part of the application materials.

NOW, I take it that in making your statement, you weren't having regard to that delivery line or supply line, I should say, from the Delta to the Central Yukon?

A That is right. I wasn't aware of the line from the Delta down to Whitehorse.

Q I see. Sir, I was wondering whether or not the opinions that you have expressed about the impact on aquatic resources have also taken into account impacts there might be in Alaska? Or have you confined your consideration to the situation in the Yukon?

A Well, I largely restricted my examination to the Yukon Territory.

Q Thank you, sir. On page 3 of your evidence you mentioned two reports that were not yet published. I wonder if it might be possible for us to obtain copies of those reports? Have those been filed as part of the panel's evidence?



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

A These reports were submitted to the printer this last week and should be available for distribution this week.

Q I see. You will put us on your list, will you?

A Most certainly, yes.  
Dr. McCart is on the top of the list.

Q Yes, I would appreciate it if you would send it to Dr. McCart and not to me as I don't intend to read them over Christmas.

The next question I have relates to a statement on page 5 of your prepared evidence, Mr. Walker, you say at the bottom of the main paragraph:

"Thus, in terms of water for overwintering, the Prime Route is most critical and the Fairbanks Route least critical, in my opinion."

To begin with, sir, I wonder if you could name any specific areas that would be impinged upon by the pipeline, either of the routes in the North Yukon, that are critical overwintering areas for fish?

A Sir, which pipeline routes are we addressing ourselves to?

Q Well, we could start with the Prime route, and then the Interior route. What I am looking for is a site specific identification of areas that are impinged upon by the pipeline routing that are critical overwintering areas for fish.

A May I turn that question over to Mr. Steigenberger? Because he is the one who



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is familiar with detail.

Q Fine. Maybe I could even shorten it a little bit and ask if there are any that have not been identified by Dr. McCart, either in the stream catalogues or in the notes on the alignment sheets. Does that help you a bit?

WITNESS STEIGENBERGER: I mentioned yesterday in my testimony that in talking to people who are working on the Beaufort Sea Project, the possibility existed of critical overwintering habitats that are downstream of the proposed crossings in close proximity to the coastal Beaufort Sea, and this is a personal communication from Ray Kendall in Whitehorse Fisheries Service office --

Q Just on that point, sir, I wonder if later you could provide us with some details of that. Dr. McCart is interested in obtaining that information.

A One example cited to me was one of a small tributary south of Stokes Point Lagoon and the presence of juvenile Arctic char were recorded in the tributary at a time that the ice was still grounded in the lagoon, it looked like the fish were isolated in that environment.

Q What time of the year was that, sir?





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1  
2 A I don't know exactly, but  
3 it was during -- I don't know, if the early part of  
4 the summer program in the Beaufort Sea when the ice  
5 in the Beaufort Sea was still grounded because you  
6 know, it had been early in the field season.

7 Q Would that be May or June  
8 then?

9 A I think you can get the  
10 specific details from Mr. Kendall.

11 Q Fine.

12 A They ~~should~~ be available  
13 in published form from the Beaufort Sea program in the  
14 near future, I think Dr. McCart has a copy of the  
15 preliminary but the final hasn't come out.

16 Q Yes sir. Now, were there  
17 other areas that you wanted to list that were critical  
18 overwintering areas for fish that have not been iden-  
19 tified by Dr. McCart?

20 A I think this goes into  
21 the argument that I presented, critical or potentially  
22 critical, or suspected, and you know, my recommendation  
23 is that all these areas, you know, be protected. If  
24 you accept that assumption, and then take into consider-  
25 ation the possibility of some of these other small  
26 areas that have been indicated by some of the biologists  
27 working in the area in the Beaufort Sea; this doesn't  
28 basically include overwintering in lakes. You know,  
29 these are groundwater seepage areas. I'm not too sure  
30 that we're going to go out and find any more dynamic



Stein, Walker  
Steigenberger, Milton  
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1 critical areas in the northern part of the Yukon.  
2 However, we do accept the fact that the Porcupine River  
3 is overwintering habitat for fish in the interior route,  
4 and we don't understand the overwintering capabilities  
5 and we don't understand the total biology of the fishes  
6 so the state of knowledge of overwintering in that  
7 habitat is still in a preliminary state.

8 Q So you're more concerned  
9 ~~then~~ about the Porcupine than you are about the North  
10 Slope, insofar as the state of knowledge is concerned.

11 A Well, I'd just like all  
12 these areas, you know, documented and potentially  
13 protected as such, you know, protected from environmental  
14 disruption.

15 Q Mr. Walker, you had some  
16 comments on the water availability on the North Slope  
17 and would you have been familiar with the evidence Dr.  
18 McCart gave before the Inquiry of the preliminary  
19 results of water availability studies that have been  
20 conducted on the North Slope by Aquatic Environments?

21 WITNESS WALKER: No sir, I am  
22 not.

23 Q Mr. Steigenberger?

24 WITNESS STEIGENBERGER: I'm  
25 aware of some of the work Dr. McCart has done on  
26 water availability, and I've already stated that at  
27 least for groundwater sources I'm not convinced that  
28 there is an adequate supply there for construction  
29 activities, and I'll just give you an example.

30 We went through a calculation



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 for amount of water that would be required for testing  
2 for ten miles of pipe, 48-inch diameter, and this  
3 represented 663,500 cubic feet, and if you assume that  
4 it takes -- if you were going to fill this pipe in  
5 24 hours, based -- these are calculations that Bob  
6 Robertson Engineering did -- if you're going to fill  
7 this pipe in 24 hours, you'd have to pump water at the  
8 rate of 4.2 cubic feet per second. This doesn't  
9 include the methanol calculation for anti-freeze  
10 depressants.

11  
12 Yesterday I got into one of  
13 Dr. McCart's reports, in Biological Report series No.  
14 17, chapter 1, table 3, page 13, and I looked at  
15 Fish Creek as an example and in April 18, 1973, he  
16 estimated the discharge in that area -- I don't know  
17 whether it's a spring, he doesn't really say what it is  
18 -- as .01 meters cubed per second. Now, this represents  
19 about .3 cubic feet per second. Now if you remember  
20 that it takes 24 hours to fill it at 4.2 cubic feet  
21 per second, you'd have to remove all the water from  
22 that groundwater source for 18 days to fill that ten  
23 miles of pipe. So in that specific case I don't think  
24 that's acceptable from a Fisheries point of view because  
25 that has been shown to be a documented overwintering  
26 population of fish, both anadromous and resident,  
27 and Dr. McCart has stated from aerial surveys, this  
28 is for greater than 1,000 Arctic char.

29 Q Which source now is this  
30 that you've done your calculations on?

A Biological Report series





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

17, chapter 1, table 3, page 13.

Q No, I'm sorry, which water source was it that you were using for the purpose of your calculations?

A It was a groundwater source on Fish Creek, and the date of the discharge measurement was April 18, 1973.

Q And which table in the Volume 17?

A Table 3, page 13.  
I think this is, you know, an extreme case, but it does show you that --

Q You'll be comforted to know that that's one of the locations that Dr. McCart's outfit have labelled as critical and they don't intend to take water from there, in any event.

Sir, are you at all aware of the applicant's response to the Pipeline Application Assessment Group question No. 52, regarding water consumption for spread "C" in the North Slope?

A Not any more than just conversation.

Q Well, it sets out what the water requirements would be in barrels for hydrostatic testing for that spread, which would be between Milepost 195 and 254, and you'll note that the figures don't in any way agree with those that you've used in your example. They suggest 40,000 barrels required for hydrostatic testing in January. Have you or your



Stein, Walker  
Steigenberger, Millen  
 Cross-Exam by Marshall

1 group measured the discharge of springs and calculated  
 2 the discharge data for springs along the prime route  
 3 in the Northern Yukon?

4 A No, that's one requirement  
 5 that I continually requested that we don't know the  
 6 discharge, and that it should be coming available in the  
 7 ~~near~~ future, or it should be investigated.

8 Q Well sir, then if you  
 9 haven't examined this, what is the source of your  
 10 information as to discharge rates?

11 A During the winter of 1974  
 12 we did biological surveys of all the crossing sites  
 13 that you're aware of in this Bio-Engineering Catalogue,  
 14 and all the rivers were frozen to the bottom except  
 15 for the Old Crow River, which was shown to have a dis-  
 16 charge of approximately 5 cubic feet per second.

17 Now the only other available  
 18 source of running water is the groundwater sources which  
 19 have been designated by Dr. McCart as a critical habitat  
 20 for fish, and I'm in agreement with him and I'm just  
 21 requesting that these areas stay designated as critical  
 22 areas, and that water ~~be~~ taken from other sources than  
 23 these discharge sources, and I recommended that some  
 24 of the best sources of water would be from large lakes  
 25 where the volumes removed would be small compared to  
 26 the total volume. I don't think that's an unreasonable  
 27 request.

28 Q Are you aware that not  
 29 all of these ~~springs~~ have fish in them?

30 A Well, they haven't been



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1  
2 demonstrated that they don't have fish. One that  
3 Dr. McCart said was a potential, and I have stated as a  
4 potential, I was informed yesterday that he himself  
5 has observed juvenile Arctic char in the area downstream  
6 of the Malcolm River crossing, and now it is no longer a  
7 potential or probable, it is a documented overwintering  
8 area.

9 Q Well, I think the point  
10 I'm making is this, sir, that there's been fairly  
11 extensive work done by Dr. McCart's company relating to  
12 water availability on the North Slope. The report of  
13 that work is not yet published. A progress report, if  
14 you like, was given and there was extensive cross-examina-  
15 tion on that subject before this Inquiry as part of  
16 Phase 2. I put it to you, you're not fully familiar  
17 with all of that evidence, is that not so?

18 A That's not so, but I  
19 mean -

20 Q That is so, in other words.  
21 You agree you're not familiar with all the data.

22 A I'm not familiar with all  
23 the data.

24 Q All right

25 A I was asked for my pro-  
26 fessional opinion of the importance of these designated  
27 critical habitats and I just requested that water  
28 from areas that are critical, water removed from areas  
29 that are critical possibly even make it more critical.  
30 We are interested in the survival of the fish.





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

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Q There's no disagreement  
with that, Mr. Steigenberger. My question was with  
respect to water availability, and is there water avail-  
able on the North Slope, and I'm suggesting to you that  
you don't have the best information that's available.



Stein, Walker  
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Cross-Exam by Marshall

A But it is available in lakes and groundwater sources. I am just requesting that they remove it from lakes.

Q What about groundwater sources that are not used by fish?

A I am not convinced that everyone has been identified as not having fish which I have just pointed out, about the presence of Arctic char juveniles downstream of the Malcolm crossing which Dr. McCart previously in his biological catalogue, number 16 had said was a possible or a potential overwintering area, and he has confirmed to me that it has been documented.

Q Well, surely, that is the point, isn't it? One can go out and examine these locations and determine whether or not there are fish in them or there are not fish in them, and if there are not fish in them then what is the concern from the point of view of a Fisheries biologist?

A Could I ask you a question?

Q Well, I think I am entitled to an answer to the question put first. I mean, if there are no fish found to be in these groundwater sources, what is your concern as a Fisheries biologist?

A I don't know whether it is an overwintering habitat or a spawning habitat, or, you know, there are other things. What about invertebrates? You know, we have heard this philosophy that these are refuge areas that act as areas that provide



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downstream drift materials or productivity of the stream. I haven't got into that because I don't know anything about it, but these are possibilities and I just wouldn't want to see them dry up. What happens if they froze and they don't unthaw, I don't --

Q Well, it might interest you to know that there has been evidence that one of these springs near the Firth River has sufficient flow that the entire requirements for Spread C, dealt with in Question 52, Pipeline Application Assessment Group, the entire water requirement for that spread can be met from 1.4 days of flow from the spring.

THE COMMISSIONER: You mean the annual requirement?

MR. MARSHALL: The total requirement for the spread for that construction season could be met from only 1.4 days of flow from one spring.

A But you don't use water all in one day, so that you are going to be taking water out of that thing in the wintertime when theoretically the discharge is going to be the lowest, because you are only talking about winter construction.

Q My point is that, indeed that is what would be intended, that the water wouldn't all be taken out at the same time. It would be taken out over a period or periods of time. Initially in the fall and early winter when winter roads are under construction, if it is necessary to make snow, and then





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

later on for construction purposes and domestic purposes, perhaps, and later again for testing. It is not all going to be taken out at the same time and dry up these sources as you're suggesting.

A Okay. In the early fall when there is still water in the river, why aren't they taking the water, you know, out of the Babbage River or out of the Firth River proper and not out of the groundwater sources?

Q Well, sir, we will have Dr. McCart send you the first copy of his water availability report when it has been published.

A Mr. Steigenberger, on the first page of your evidence you are dealing with the report of the Environmental-Social Committee, Bryan et al., ESP 73-21. You made reference to the Firth River and the Fishing Branch River you said, quote:

"Within the Yukon Territory the report stated the pipeline should not be allowed to cross portions of spawning areas in the Firth River (Prime Route), Fishing Branch River (Interior Route) and any major spawning ground in general."

Now, sir, with respect to the Firth River, it is my information that the majority of the spawning takes place about 60 miles upstream in the area of Joe Creek near the Alaska border, is that your information as well?

A The majority of it, yes.



Q Do you know of any spawning in the vicinity of the proposed pipeline crossing, say, within one or two miles?

A None has been documented to date.

Q I am informed as well that the crossing location is frozen to the bottom in winter, do you know if that is so?

A The water survey states that there is no water above the gravel, in other words, it is frozen to the gravel bottom, the passage of water below the gravel substrate has never been investigated to my knowledge.

Q And if it is frozen to the gravel then it is unlikely to be a spawning area, does that follow?

A I think it depends, if there is percolation of water through the gravel and the ice can be maintained by water supplies. I think we have to have some drilling in some of these areas and investigate that.

Q Can you tell us of any area where Arctic char are known to spawn in streams that would be frozen to the bottom in winter?

A No, I couldn't .

Q About the Fishing Branch River, how far from the spawning grounds would the nearest portion of the Interior Route be?

A Greater than 100 miles, I guess.



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

Q Thank you. So really we are not concerned with that in connection with the pipeline, there are other concerns, I gather, related to international fisheries and so on, that make this an important river that's warranted the study that it has received, would that be fair, Mr. Walker?

WITNESS WALKER: Not only international fisheries, but also our own fisheries, yes. It makes it a very important area.

MR. ANTHONY: Mr. Marshall, Mr. Stein before you move on, I believe/indicated that he wished to add something on this subject.

WITNESS STEIN: I just wanted to point out, sir, that I think what Mr. Steigenberger has provided here again is a general recommendation that these areas be avoided and I would also ask that despite the fact that, at this time, he cannot relate a specific crossing site to a spawning area, say, in close proximity, I would also ask what guarantee we have that that crossing site is not going to change in the future.

MR. MARSHALL: Well, of course, that is a matter subject to regulation as I am sure you are well aware of, but I want to explore this idea that further in another context, and that is this watershed concept that has been discussed at some length in the evidence. Now, I should say at the beginning that there is really no disagreement, pretty that there is some value in having detailed information





Stein, Walker  
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1 about various watersheds, but the point I want to make  
2 is that surely there is a point at which judgment has  
3 to be exercised as to the extent which it is necessary  
4 to study a watershed in order to be able to form an  
5 opinion as to the impact of any intended activity,  
6 say, a pipeline crossing of a portion of that water-  
7 shed.

8 Now, Mr. Steigenberger, I  
9 believe it was in your evidence that this came up,  
10 was it not?

11 WITNESS STEIGENBERGER: Yes.

12 Q Would you agree with  
13 me that in order to assess the impact on a stream of  
14 a pipeline crossing, that you really don't have to  
15 know all there is to know about the aquatic resources  
16 of that entire watershed?

17 A Yes, I would agree with  
18 that statement, but I think that you have to have  
19 some good baseline information.

20 Q What about you, sir?  
21 Do you agree with that?

22 WITNESS STEIN: Most definitely.

23 Q You would agree that  
24 you would not have to know all about the entire water-  
25 shed to make an impact assessment of a pipeline  
26 crossing?

27 A I would say that there  
28 are probably some aspects of a watershed that would  
29 not require detailed studies.

30 Q Well, let me give an



Stein, Walker  
Steigenberger, Millen  
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1 example. I understand with the Mackenzie River, which  
2 is your area of interest, that really the watershed  
3 starts at Summit Lake which is at Prince George and  
4 you would agree with me, I suppose, that it would be  
5 absurd to suggest that we have to study that entire  
6 watershed in order to be able to assess the impact of  
7 a pipeline crossing of that river, say, at Swimming  
8 Point?

9 A You have picked the  
10 extreme, sir, and yes, I would agree to that specific  
11 example.

12 Q Would you agree with  
13 me that what you have to do is consider the intended  
14 activity, in this case a pipeline river crossing and  
15 form a judgment as to the zone or reach of the  
16 river that will likely be subjected to impact and I  
17 would like to give you some examples. You look at the  
18 area affected by the ditch or trench and the deposit  
19 of spoil, and you look at the area that would be  
20 affected in the event blasting were used, and you  
21 look at the reach of the river that might be affected  
22 by any sedimentation, and of course, you have to  
23 know some particulars on aquatic resources within  
24 that reach, for example: overwintering, spawning or  
25 migration periods affecting that reach of the  
26 river, would you agree with me?

27 A Yes.

28 Q Now, sir, would you  
29 go one step further and agree that if you do know those  
30 things you can assess the impact of a pipeline crossing



1 at a river at a particular place?

2 A I would agree that the  
3 emphasis should be on the downstream portion from  
4 that crossing point. I think that there is also  
5 value in knowing what utilization is being made of  
6 the upstream portion by the resource. You need an  
7 estimate, I think, of what the relative numbers of  
8 fish are that are spawning up above in order to  
9 provide, I think, a good, or provide good protection  
10 for those fish when they pass the crossing site. I  
11 think that there is also the requirement that you  
12 have good baseline information for the entire system  
13 to take into consideration such factors as changes in  
14 alignment. The situation where gravel sources do not  
15 prove, say, to be sufficient and where a request may  
16 be made to remove the gravels from upstream portions.

17 Q Well, I think, sir, that  
18 you are getting back to an analysis of the entire  
19 watershed again. Let's maybe take it bit by bit.  
20 If you can take as a given that the location of  
21 crossings is a regulated matter, that is, an alignment  
22 is granted, a right-of-way for a particular alignment  
23 is set in a grant from the Crown, and that the  
24 taking of borrow materials is also a regulated  
25 activity and that the sites will be designated and  
26 there will be requirements for applications for  
27 removal of borrow from various locations. Now, that  
28 takes away two of the variables, it seems to me,  
29 that you are concerned about, does it not.  
30





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1                                   A     I'm not willing to  
2     accept, sir, that when the actual construction of this  
3     project commences and follows through to completion that  
4     things are going to remain exactly the way as they are  
5     outlined even on a permit. Situations change, require-  
6     ments change. I think we have to allow for that flexi-  
7     bility.

8                                   Q     But surely we're talking  
9     about a reach of the river that's perhaps several miles  
10    in extent, not talking about an entire watershed.

11                                  A     I'm sorry, I don't get  
12    the point of your question.

13                                  Q     Well, you say that you're  
14    concerned about the precise crossing location being  
15    changed, the precise location at which borrow is being  
16    taken being changed. I'm suggesting to you, sir, that  
17    this isn't something that relates to the whole of the  
18    watershed. We're talking about changes that might be  
19    confined to say within a relatively short reach of the  
20    river.

21                                  A     What I'm trying to do  
22    here, I think, is to hopefully avoid the possibility of  
23    having to go in and redo work that could have been done  
24    now.

25                                  Q     Well, I appreciate that,  
26    sir. What I am trying to narrow in on is just how exten-  
27    sive a reach of the river must be subjected to fairly  
28    detailed study before an impact assessment can be  
29    made, crossing that river?     Now I think in your  
30    evidence you were concerned about the entire length of



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 certain of the rivers. What I'm trying to get you to  
2 agree with me is that really our concerns should be  
3 focused on the reach of the river that might be impacted.

4 A I think I already agreed  
5 with that, sir, that the emphasis must be placed on  
6 the crossing point and that area below the crossing  
7 point; as far as how far upstream studies should be  
8 implemented, I think that is going to have to vary with  
9 the characteristics of the individual stream.

10 Q O.K., and that's a question  
11 of judgment.

12 A That is an answer from  
13 my judgment. I answered that from my opinion.

14 Q Well then this gets us  
15 into a point that I started on with you the other day,  
16 related to spawning and overwintering areas. Against  
17 the backgroun d of the discussion we just had, I  
18 wonder if you could identify specifically any fall  
19 spawning or overwintering areas that in your opinion  
20 will be directly impinged upon by pipeline construction,  
21 in the area of your interest in the Mackenzie River,  
22 that haven't already been identified by Dr. McCart in  
23 his catalogues or on notes in the alignment sheet. Is  
24 there anything that is in addition to that, in your  
25 review?

26 A I think I answered that  
27 again, sir, <sup>in</sup> my addition after lunch yesterday.

28 Q Would you like to answer  
29 that again? I'd like you to go back on that, if you  
30 could and tell me if there are any specific areas that



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 you can identify as fall spawning areas or overwintering  
2 areas that would be directly impinged upon by pipeline  
3 construction that has not already been identified by  
4 the stream catalogues or notes in the alignment sheets?

5 A I said, Mr. Marshall, in  
6 part I think the second part of the question, was there  
7 any spawning streams for these species crossed by the  
8 proposed route; since known sites have not been iden-  
9 tified by ourselves, nor as far as I am aware by Dr.  
10 McCart, the answer would have to be , "I don't know."

11 Q You're suggesting that  
12 Aquatic Environments haven't identified these sites?  
13 You say that no sites have been identified, is that  
14 your evidence?

15 A I say as I recall it  
16 right now, I cannot give a specific example of any sites  
17 that Mr. McCart has identified, without going back  
18 through the material again.

19 Q What about Hodgson Creek?

20 A I'm sorry, sir, I say  
21 without going back through the material I don't think  
22 that I could respond to that.

23 Q Well, is it fair to say  
24 that at this point you really don't know?

25 A I said that.

26 Q You'd have to go back  
27 through your notes and check.

28 A Yes.

29 Q Perhaps you'd be good enough  
30 to do that, sir, if you would check your notes and see





Stein, Walker  
~~Steigenberger~~, Millen  
Cross-Exam by Marshall

1 which sites have not been identified, by the catalogues  
2 or the notes in the alignment sheet.

3 A That's going to take some  
4 time. If I can qualify that now too, this was  
5 fall spawning species I was referring to.

6 Q Yes. I think you're  
7 also concerned about overwintering sites for any species,  
8 and perhaps you could do that as well. Would that be  
9 possible, sir?

10 A Overwintering sites, I  
11 don't quite -- this -- you're asking an entirely differ-  
12 ent question now.

13 Q Well, we asked about  
14 spawning areas first. That was one of your areas of  
15 concern.

16 A Right.

17 Q Now I'm asking you about  
18 overwintering sites, whether or not there are over-  
19 wintering areas -

20 A For the coregonid species?  
21 We have identified overwintering sites.

22 Q Well, are there any  
23 overwintering areas that in your judgment would be  
24 directly impinged upon by pipeline construction that  
25 have not been identified by stream catalogues or notes  
26 in the alignment sheets?

27 A None that I can recall  
28 at this time.

29 Q Well, if your memory -- if  
30 it comes back to you, perhaps you could let us know



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 through Mr. Anthony.

2 A We have identified, of  
3 course, the Mackenzie Delta as being generally an  
4 overwintering site that obviously would be crossed.

5 Q Well, have you done it  
6 in any more specific detail than that?

7 A There has been some  
8 sites identified, as I recall, under the Beaufort Sea  
9 studies that we have conducted. I think Malloch Bay  
10 was one.

11 Q And this material will  
12 be found in that study that's about to come out, will it?

13 A It should be, yes.

14 MR. ANTHONY: Perhaps I could  
15 ask Mr. Marshall to clarify something so I under-  
16 stand just exactly what the witness is being asked to  
17 do. I think if probably he can come up with a list of  
18 the areas that he has identified, I don't know  
19 whether it's fair to ask the witness to then go back  
20 and review all of Dr. McCart's additional work and  
21 see where his -- what additions he has. Perhaps Mr.  
22 Marshall could do that, and perhaps it would be sufficient  
23 for this Inquiry if Mr. Stein has merely identified all  
24 of those points that he identified as critical, and then  
25 the comparison work could be accomplished by Mr.  
26 Marshall or members of his staff if a comparison is  
27 of any significance.

28 MR. MARSHALL: I think really  
29 the point of the question was directed at whether or  
30 not we've missed things in the witness' view. Have we



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 missed fall spawning areas or overwintering areas that  
2 would be impinged upon by pipeline activities? That's  
3 really what I'm interested in and --

4 THE COMMISSIONER: That's a  
5 critical difference in a way between -- specifically  
6 between the evidence of Dr. McCart and the evidence  
7 of the panel, excluding Mr. Millen. That's -- I think  
8 it's a legitimate query, and if it's possible to answer  
9 it ought to be answered. One of the difficulties is  
10 as M r. Steigenberger said, Dr. McCart says, "We know  
11 where fish are," and Mr. Steigenberger said, "Well  
12 there are some places where we don't know that fish are  
13 not there." That's a problem that I think you'll find  
14 throughout this Inquiry, that poses itself when you  
15 consider the position of Arctic Gas/<sup>on the one hand</sup>and Foothills  
16 and the position of government biologists on the other  
17 hand. I appreciate that if you say, "We don't know  
18 that they are not there," you can't really go much  
19 further than that, but if you know some places where  
20 they are spawning, migrating, overwintering, that  
21 Dr. McCart hasn't listed or indicated, then those should  
22 be listed for us and for Dr. McCart. That's, I think,  
23 where we've gotten to.

24 MR. MARSHALL: Thank you, sir.

25 A Could I just answer,  
26 Mr. Marshall? Maybe I missed the exact point of that  
27 question. Were you asking, "Has Dr. McCart identified  
28 any sites that we have not identified?"

29 Q No, it's the other way  
30 around, I guess.





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

A Have we identified any site that he has not? Well, I think as I said, we have not been able to identify any spawning sites for these species, so I think the question more or less answers itself.

Q Now gentlemen --

THE COMMISSIONER: Excuse me, so I understand your position, that's why you said there should be a further program to collect data to examine areas where your knowledge is incomplete to see if they are spawning, migrating, or overwintering. That's the crux of it, isn't it?

A That's correct, sir.

Q Mr. Steigenberg?

WITNESS STEIGENBERG: I'd like to ask Mr. Marshall if he believes that Dr. McCart himself has identified all these critical areas, or is there some question about -- is there some question of doubt in his mind that there are additional areas so that the onus is taken off our shoulders and put onto a very competent biologist's.

THE COMMISSIONER: Well, I don't think we'll ask Mr. Marshall to answer that question.

MR. RYDER: Really, Mr. Commissioner, it's a problem of harmonizing the material that this panel has on the one hand to the material that Dr. McCart has on the other hand in some kind of cohesive system so that argument can be made with respect to it. Now, Dr. McCart's material is scattered throughout a series of volumes. The evidence of this panel is also not



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 in cohesive list form. It may be useful if the repre-  
2 sentatives of both groups of witnesses could get  
3 together so that the Inquiry can have available to it  
4 some comprehensive list as to what the areas where we  
5 understand are critical and the areas where there may  
6 be a possibility of a sensitivity, and the areas where  
7 we know there is no sensitivity.

8 MR. MARSHALL: Mr. Ryder, that's  
9 the purpose of the stream catalogue. It puts together  
10 the data that Aquatic Environments has, and the available  
11 published data from government sources. That's what  
12 the attempt was directed towards.



Millen, Steigenberger,  
Walker, Stein  
Cross-Exam by Marshall

1 MR. RYDER: Then perhaps the  
2 panel can have a look at the stream catalogue and then  
3 assess whether it really fills the bill.

4 MR. MARSHALL: They have got  
5 that as  
6 do the other participants.

7 THE COMMISSIONER: What I  
8 suggest is, Mr. Marshall, that at noon hour, perhaps  
9 Mr. Ryder, Mr. Anthony and you and Dr. McCart and the  
10 panel could have a short conference and try to sort this  
11 out.

12 MR. MARSHALL: Fine, sir..

13 THE COMMISSIONER: And perhaps  
14 Mr. Ryder could act as chairman of that group and --

15 MR. MARSHALL: Chairman and  
16 host.

17 MR. RYDER: That means that  
18 I buy.

19 MR. MARSHALL: Well that's near  
20 and just, sir, I am prepared to go along with that.

21 Gentlemen, I noticed  
22 several references throughout your evidence to sugges-  
23 tions that there ought to be site-specific assessment  
24 by fisheries biologists of certain things; crossing  
25 locations, areas where water removal and borrow  
26 operations, that sort of thing. Now, this has been  
27 kind of the subject of a lot of discussion at the  
28 Inquiry with Mr. Scott, Commission Counsel and some  
29 of the witnesses and I think it is fair to put it  
30 this way that Mr. Scott seems less enamoured of the  
site-specific assessment approach than is Arctic Gas.





Millen, Steigenberger  
Walker, Stein  
Cross-Exam by Marshall

1 Do you people, as fisheries  
2 biologists, see that overall it would be better to have  
3 a site-specific assessment when final design is being  
4 arrived at; that if crossing locations are being precisely  
5 nailed down and gravel sources and water sources are  
6 being precisely nailed down, rather than having a  
7 general rule or guideline, which I submit would have to  
8 be somewhat arbitrary. Now, do you have a preference as  
9 to approach in this subject and we could start with  
10 the first volunteer.

11 MR. ANTHONY: Mr. Millen could  
12 answer that.

13 WITNESS MILLEN: Yes, I offered  
14 some comment on that, I believe, in my testimony and  
15 I believe that some general rules and guidelines are  
16 very useful; that is, before the final design is  
17 arrived at, this guidance can be given to the applicant  
18 and that should resolve a lot of the potential for the  
19 debate between biologists, if those guidelines can be  
20 given. Subsequent to that, the Applicant can provided  
21 in the majority of cases that he meets that guideline  
22 in the cases where he has difficulty meeting the  
23 guideline can pursue the matter on a site-specific  
24 basis and that would be my preference for the way in  
25 which the final design can be arrived at and agreed  
26 upon.

27 WITNESS STEIGENBERGER: I  
28 believe that the E.P.B., the Environmental Protection  
29 Board, has, you know, has taken this approach and they  
30 want some kind of environmental code or some type of an



Millen, Steigenberger,  
Walker, Stein  
Cross-Exam by Marshall

1 authority where you have set general guidelines and  
2 thou shalt not do certain things and in principle, I  
3 agree with that but it is not all encompassing in there  
4 has to be site-specific in addition to certain things  
5 that are mandatory and I would like to emphasize the  
6 word, "mandatory", that if you set them up that you  
7 adhere to them.

8 Q Mr. Stein?

9 WITNESS STEIN: I would like  
10 to say that I think pretty well in agreement with what  
11 Mr. Millen has already said that it would be very  
12 difficult for any individual or any individuals with  
13 the responsibility of making an impact assessment of  
14 that final design, if he did not have the complete  
15 information available.

16 Q Mr. Walker, did you have  
17 a comment on that?

18 WITNESS WALKER: No, I have  
19 nothing to add. I think the subject has been covered  
20 adequately.

21 Q All right. Let me work  
22 through an example with you, gentlemen. Our concern  
23 has been that if you set a rigid guideline that it may  
24 prove in a particular circumstance to cause more  
25 environmental damage than would result if there were  
26 a site-specific assessment. For example, if you were  
27 talking about the distance that a borrow source, say,  
28 must be from streams, <sup>and</sup> you arbitrarily have a rule, you  
29 may do more damage by going that far away from where  
30 you want to get the gravel, in order to meet that  
arbitrary rule than you would if you had a site-specific



Millen, Steigenberger  
Walker, Stein  
Cross-Exam by Marshall

1 assessment of a particular location and chose what was  
2 in fact what was the least disturbing area from which  
3 to take the gravel. Do you generally have that sort of  
4 concern about rigid guidelines?

5 A Well, in instances like  
6 you have just described, I would think that you would  
7 build an appeal system into the agency framework so that  
8 you have a guideline but it may not meet every situation  
9 and you have the opportunity therefore to take a  
10 specific site and have it reviewed.

11 WITNESS STEIGENBERGER: I  
12 would just like to add that I am not, Mr. Marshall's  
13 question is that -- I interpret it as meaning that it was an  
14 exception and not the general rule and that the -- if  
15 you have a general -- if what you are saying is an  
16 exception to the general rule, then the environmental  
17 code is still a good idea and the site-specific in the  
18 appeal system allow some flexibility to modify it for  
19 each specific instance.

20 Q Well then, what we are  
21 really talking about is not a code per se but guidelines  
22 which should be deviated from depending on the particular  
23 circumstances if there is going to be less environmental  
24 impact by doing so?

25 WITNESS WALKER: Yes.

26 Q In your evidence, Mr.  
27 Steigenberger, you make reference to recommendations in  
28 the Bryan Report and also in Appendix IV to your  
29 testimony, there a number of sites specific recommenda-  
30 tions?





WITNESS STEIGENBERGER: Yes.

Q Now, sir, to the extent that they contain reference to river engineering and hydrological matters, is it fair to say that they go outside of your field of expertise and you have no professional opinion as to their necessity, applicacy or usefulness?

A I disagree with that statement. The second author on the paper is a very qualified engineer and this was -- more than myself wrote this paper --

Q I am talking about your professional opinion, now, sir. I am not talking about whether or not we could debate those recommendations. I am talking about whether we can debate them with you. I suggest we cannot. That is outside of your field of expertise.

MR. ANTHONY: The evidence of Mr. Steigenberger was that the site-specific recommendations in that report was a joint venture by himself and an engineer to try to marry the two perspectives and I think certainly he would be in a position to discuss the site-specific situation giving his biological perspective to it and so I think the engineering requirements or the recommendations that are outlined in that appendix certainly can be discussed from that perspective.

MR. MARSHALL: Well, I would like to have the witness's answer if I may, sir, to the question.



Millen, Steigenberger  
Walker, Stein  
Cross-Exam by Marshall

1  
2 A As these recommendations  
3 relate to fish, you know, sedimentation as one example,  
4 does relate to fish.

5 Q Well, let me approach it  
6 this way. Yes, you are concerned with sedimentation.  
7 So are all the fish biologists but as to the  
8 engineering solution to the sedimentation problem, that  
9 is someone else's area. That is a river engineering  
10 problem, is it not?

11 A I believe that Mr. Millen  
12 would be better qualified to answer that question and  
13 he has already answered it in some aspects.

14 Q Well, this has been  
15 presented in your evidence though, this is an appendix  
16 to your evidence and there is some specific recommenda-  
17 tions about the extent to which the pipe ought to be  
18 buried and the length over which the crossing ought to  
19 be made and what specific protection measures ought to  
20 be taken to control against erosion and that sort of  
21 thing, on a site-specific basis.

22 A Yes.

23 Q Now, professionally, you  
24 are not qualified to comment on the usefulness of those  
25 techniques and whether or not in the point of view of  
26 river engineering those are required or they are not  
27 required, that is my point.

28 A I am not qualified to  
29 comment on that from an engineering point of view.

30 Q Fine. I'll leave them  
then.



Millen, Steigenberger  
Walker, Stein  
Cross-Exam by Marshall

1  
2 A But they are recommenda-  
3 tions and I don't feel they should be ignored. If you  
4 want the specific engineering, then you should some  
5 time in the future cross-examine the engineer that  
6 wrote them.

7 Q And that was who, sir?

8 A The second author on the  
9 paper, R.A. Robertson.

10 Q We might do that.

11 Mr. Steigenberger, you  
12 discussed at some length the history of domestic fishing  
13 in the North Yukon, going back some number of years.  
14 Sir, in your opinion, does that demonstrate the  
15 resiliency of these populations. They could have  
16 recovered to their present/<sup>levels</sup>from such extensive  
17 fishing activity.

18 A I couldn't answer that  
19 question because in compiling a lot of data were just  
20 interviews of people and they do not really talk about  
21 resiliency.

22 Q But they do talk about  
23 numbers and catch per unit efforts and that sort of  
24 thing? Mr. Walker, can you help us here?

25 WITNESS WALKER: The term,  
26 "resilience", we have a population level, normal  
27 population level, then it is depressed to some point here.  
28 Now, in returning the level to its former level. That  
29 is resilience. Is that what you interpret as  
30 resilience?





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

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Q I think that's a fair statement.

A Then you assume then that under the historic fishing pattern the populations were depressed.

Q Well, I took that from the evidence, that there had been fairly significant fishing pressures on the fish resources of the Northern Yukon, and reference was made to the large -- fairly large population that was on the North Coast associated with whaling, and the much larger historic catches or the involvement in fishing at say Old Crow, and what I gathered from the evidence was that there was quite a heavy utilization of fish resources historically, that it depressed the populations <sup>below</sup> the levels that they are presently at. Maybe I read too much into it.

A Well, I think the indications are that the exploitation level or the magnitude of exploitation was much higher at one time than it is now, and we really don't know from the total population size whether the exploitation rate was 75%, 25%, or something of that magnitude. However, if we assume that it was a significant size, to depress that population and the population as we measure it today, it has gone back to its normal and is higher than in the days when exploitation was taking place.

Well then you would say resilience has taken place.

Q Fine. Thank you, sir.



and your resume.

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Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 Do you know, sir, if anyone else involved with the  
2 Fisheries Service is looking after this concept?

3 A Not in a specific way,  
4 no, I don't know.

5 Q I see. Sir, you talked  
6 about avoidance of stream mouths and I was wondering  
7 whether or not an attempt had been made to estimate  
8 the area of sensitivity associated with stream mouths.  
9 What sort of an area are you talking about?

10 A This has certainly been  
11 discussed. In formulating our recommendations for  
12 the routing of the Mackenzie Highway, there was a lot  
13 of discussion of this point, and the conclusion that  
14 we arrived at was that in locating the highway it would  
15 be desirable for the highway crossing to be further  
16 upstream than 1,500 feet from the mouth of the stream.  
17 That is, this recommendation was specifically made for  
18 routing the highway, and in most cases it was observed.

19 Q Sir, on page 3 of your  
20 evidence you had a comment about ice roads. You say --

21 MR. ANTHONY: Sorry, Mr.  
22 Marshall, before you leave this subject, Mr. Walker  
23 indicated he wanted to comment on the stream mouth  
24 question you raised, if he may be permitted.

25 MR. MARSHALL: Actually I wanted  
26 to leave it until after lunch because Dr. McCart's  
27 got a point on it as well, but go ahead, Mr. Walker.

28 WITNESS WALKER: No, it is not  
29 a subject on a stream mouth, so may I cancel that  
30 request?





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

Q Back to ice roads, sir,  
on page e 3 you say:

"Alternatively, extensive ice road building  
will be required. Here pollution control  
measures and drainage provisions comparable  
with that required for an all-weather road  
will be required."

Sir, are you meaning that in relation to ice roads?

WITNESS MILLEN: No, I was  
meaning it in relation to the construction of access  
roads in general, and I had some difficulty reviewing  
your application in particular, deciding whether in  
the mid-section of the Mackenzie Valley, I was quite  
concerned with in this topic, whether you proposed  
in fact to grade those roads or construct ice roads.  
It wasn't clear to me from your application or my  
reading of the evidence.

Q I see. You would agree  
that as ice roads are only in existence during the  
winter, that erosion control measures and drainage  
provisions comparable to those for all-weather roads  
wouldn't be needed.

A No, I wouldn't agree with  
your statement there entirely. I think the ice roads  
on side slopes, as I envisage them, may indeed require  
specific precautions because they will alter the  
drainage characteristics in the spring runoff period.  
That is I believe if you have a grade constructed --  
a highway grade constructed on a side slope that there  
will be sufficient of the ice road left in the runoff



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1 period to cause a problem.

2 Q Unless the ice road is  
3 removed from natural drainage courses.

4 A It would be more than  
5 natural drainage courses involved, I believe. That is  
6 it would cross the whole slope, and affect the slope  
7 drainage in general.

8 Q Well, the point I'm making  
9 is that surely you don't have to engineer these  
10 measures into ice roads to the same extent that you do  
11 with permanent highways.

12 A C certainly not to the same  
13 extent in the case of ice roads.

14 Q Now sir, on minor stream  
15 crossings, at pages 3 and 4 of your prepared evidence  
16 you dealt with them. Now I'm not sure if I understood  
17 you correctly and I want to go through this with you.  
18 Arctic Gas has indicated they plan to design specifically  
19 150 to 200 stream crossings in the Territories. Are  
20 you with me?

21 A Yes, I'm **with** you there.

22 Q Do I read your evidence  
23 indicating that in addition to that, they ought to  
24 specifically design some 400 additional minor stream  
25 crossings?

26 A I envisaged in this  
27 case that the design could be a selection of standard  
28 designs, but that the standard design selected for  
29 each stream would be indicated. That is that for  
30 each of these minor streams a decision would have been



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1  
2 made as to what precautions were to be taken at that  
3 site. Now, it would not mean that you had to write out  
4 a new specification for every site, but you may have  
5 some standards that you applied and selected them for  
6 that site.

7 Q So you're suggesting  
8 for example that the design manual ought to indicate  
9 procedure A, or B, or C, or whatever it may be, that  
10 is considered appropriate by the engineers involved  
11 with drainage erosion control and that sort of thing.

12 A Yes,

13 Q That ought to be indicated  
14 for minor stream crossings?

15 A For every minor --

16 Q You're not talking about  
17 an entirely separate profile of that crossing, and the  
18 depth of burial being worked out precisely and that  
19 sort of thing.

20 A No, I don't believe that  
21 would be necessary.

22 Q Mr. Stein, on page 6  
23 of your prepared evidence this statement was made:

24 "Although sources of these materials,"

25 and he's speaking of granular materials,

26 "have been surveyed, the applicant has stated  
27 that/<sup>known</sup> terrestrial supplies will not meet  
28 expected needs and that alternative sources  
29 will be sought specifically stream gravels  
30 from the active flood plain."





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall  
Now, you're dealing with here,

I take it, the Mackenzie area.

WITNESS STEIN: Yes sir, I am.

Q I wonder if you had a  
reference on that, sir, because I'm told that that  
statement isn't accurate.

A I understand that it, to  
the best of my knowledge, it is in the testimony on  
occasion. I also have some gravel sources that I have  
taken from the alignment sheet which appear to me  
to be the active flood plain.

Q My information was, sir,  
that the witness has acknowledged that there may be  
local shortages of granular materials and here we're  
dealing with along the Mackenzie. It's not generally  
necessary to seek alternative sources, particularly  
at stream, particularly stream gravels.

If you've got some other  
reference, perhaps you could give it to me.

A Other references along  
those lines, I cannot give you offhand, sir, but as I  
say from the alignment sheet, the borrow source shown  
at Milepost 387 on Francis Creek appears to be directly  
in the middle of the stream.

Q Is that an alternative or  
preferred?

A I can't recall that offhand  
sir.

Q Well, we can check that.  
Sir, further in your evidence you recommended that



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Marshall

1  
2 guidelines of the Fisheries & Marine Service for the  
3 protection of fish resources be applied to pipeline  
4 construction also, and these guidelines recommend that  
5 gravel removal operations be limited to areas above  
6 the designed flood high water stage. We weren't  
7 sure what that term meant.

8 A Well, perhaps Mr Millen  
9 can comment on this further, but as I say, in my  
10 interpretation that is usually the stage, the design  
11 stage for the one in 50-year flood.

12 Q Mr. Millen, do you wish  
13 to comment on that?

14 WITNESS MILLEN: Yes, in  
15 considering the Mackenzie Highway design, for most major  
16 streams and rivers, the design flood was indeed the-  
17 what was estimated to be the one in 50 year flood.

18 Q Would you tell us how  
19 that would apply to gravel mining operations in alluvial  
20 sands and braided streams such as the North Slope?  
21 How would one apply that test?

22 A No, I don't think I'd  
23 comment on the North Slope. I haven't studied streams  
24 on the North Slope at all.

25 WITNESS STEIN: These guidelines,  
26 also, Mr. Marshall, as you recall, are for the N.W.T.  
27 and not the Yukon.

28 MR. MARSHALL:  
29 They are for the Northwest  
30 Territories and specifically the Mackenzie, I see.  
Gentlemen, I think those are all my questions.



Stein, Walker  
Steigenberger, Millen

1 THE COMMISSIONER: Well, thank  
2 you, Mr. Marshall. We'll adjourn until two o'clock and  
3 then Mr. Ryder can ask his questions.

4 (PROCEEDINGS ADJOURNED TO 2 P.M.)  
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Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Ryder

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR.MARSHALL: Mr. Commissioner,

I am filing a report entitled "Terrestrial Mammal Studies Along Cross-Delta Pipeline Route", by Renewable Resources Consulting Services Ltd., dated December 1975. I would like to enter that as the next exhibit. I am having copies run off and they should be available by the coffee break for the participants.

CROSS-EXAMINATION BY MR. RYDER:

Q For the past two days we have been discussing the problems which you foresee as a result of the information gaps in the information at hand either with respect to the data gathered by the government or with respect to the data gathered by the applicants, and I just want to deal with the implications for this Inquiry arising from these gaps in information, and tell me if I understand the implications correctly. It seems to me that they are twofold. The first is that we are not able to determine now if the pipeline can be built and at the same time the fish resource is protected adequately; and the second implication is that assuming that a pipeline can be built with a reasonable standard of protection for the fish, we still don't know when and where fish concerns will be precisely affected by the pipeline construction, so we aren't able to say when and where special protection measures ought to be implemented, and do I have the implications of the difficulty confronting us resulting from the information



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1 gaps that we must live with at the moment? Can I ask  
2 you, Mr. Stein?

3 WITNESS STEIN: I am sorry,  
4 sir, I think I missed the final question in that --

5 Q Well, I am trying to  
6 say that there are two implications --

7 A That much I got. What  
8 was the final --

9 Q And the second implica-  
10 tion -- do you have that?

11 A Yes.

12 Q -- which is we are not  
13 able to determine where and when protection measures  
14 are required. Now, I am simply asking you, do I under-  
15 stand correctly the implications for this Inquiry  
16 resulting from the lack of information?

17 A Yes, I think you do --

18 Q And I take it that is  
19 the concensus of the panel as a whole? Mr. Walker?  
20 Mr. Steigenberger?

21 WITNESS STEIGENBERGER: In  
22 the general.

23 Q Mr. Millen?

24 WITNESS MILLEN: Yes, I think  
25 you have stated them fairly.

26 Q All right. Now, dealing  
27 with the information that we need to have to ensure  
28 adequate protection of the fisheries resource, it  
29 appears to me that the information falls into three  
30 categories that we have been discussing. The first is



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1 base line information and the second is the experimental  
2 studies which are required to determine the tolerance  
3 levels of the species to environmental damage, and  
4 then the third is a second set of environmental studies  
5 and experiments required to develop the mitigation and  
6 engineering techniques, the engineering techniques  
7 required for mitigation methods.

8 Now, can I deal with some  
9 unanswered questions with respect to the baseline  
10 environmental information, and the first area is  
11 with respect to winter biology that I think one member  
12 of the panel mentioned.

13 Now, if we can assume at the  
14 moment that the task of filling this information  
15 gap is cast upon the pipeline companies, could you  
16 give them some direction as to the kinds of information  
17 and the kinds of data you require? How you would  
18 propose collecting that data? Mr. Stein?

19 WITNESS STEIN: Well, this  
20 seems like an awful lot of rehashing.

21 Q Well, you mentioned  
22 the data, rather you mentioned the subject matter  
23 which you felt was deficient, but you didn't give  
24 any positive, as I understood your evidence, directions  
25 to the body or the corporation required to fill this  
26 information gap as to what data should they look for,  
27 how should it be collected, and what methods would be  
28 satisfactory to you. For example, should they take  
29 representative streams and study them and extrapolate  
30 the information from these representative streams to the





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balance of streams to be crossed by the pipeline?

A In some circumstances I think that it is both. Concerning overwintering areas, I would like to see to satisfy myself, winter studies conducted on, essentially, every tributary that is being crossed, and that is asking for a lot, I am aware of that. I would say that the emphasis again would be placed on pretty well the full downstream area below the trenching point.

Concerning things like methanol, you certainly don't have to look at every single tributary, but I am, or have an awful void here as far as knowledge and understanding of how methanol is likely to react under winter conditions in the Arctic. Now, they say that that is one that could be site specific.

I think the other part of your question was techniques. This is one that is going to have to have an awful lot of thought and perhaps an awful lot of experimentation. If it was that easy a question to answer, I think we 'certainly would have done an awful lot more than has been accomplished to date.



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Q Was being recommended  
by you?

A I have recommended that  
there is this gap and that somehow it should be filled,  
yes.

Q And what I'm seeking from  
this panel is some direction as to how the pipeline  
companies, if it was cast upon them, should go about  
filling these gaps. Have you anything to add, Mr. Stein?

A It would seem to me that  
perhaps even a boring program downstream of these  
crossings, you may recall I made reference to my concern  
about overwintering areas which are not readily visible.  
We have the sites with aufeis and the open water areas.  
I am concerned that there may be an awful lot more  
there that is not readily available, and to me a reason-  
able solution then would be that rather than concentrat-  
ing on your boring program, at the specific crossing  
site that it be extended downstream. Now this would  
at least to my way of thinking answer my question about  
whether there are any additional sites that we haven't  
been able to see, or to determine. You are still left  
with the problem of then determining, assuming that  
open water, say a deep pool situation, is encountered,  
you still have the problem of answering the question  
about whether there are any fish in there. That, I say,  
the winter sampling techniques are, effective ones at  
least, are very difficult to lay out and I think it  
would depend on a site specific situation partly, or  
perhaps even mostly, dependent on the depth of water



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1 that you locate.

2 Q Mr. Walker, do you have  
3 anything to add to that question?

4 WITNESS WALKER: In reference  
5 to kinds of data, I'm not clear in my own mind whether  
6 we have the adequate information on gravel resources  
7 and water quantities, although I know that these two  
8 factors have been looked at to some degree. Mr. Stein  
9 has mentioned overwintering and further classification  
10 of critical areas in and close to pipeline crossing  
11 sites, and I would add nothing further at this time.

12 Q And I ask you now, Mr.  
13 Steigenberger.

14 WITNESS STEIGENBERGER: Well,  
15 within the northern Yukon Territory we've stated  
16 previously that winter again is considered a critical  
17 time of the year and I don't know, I'm drawn into this  
18 thing sedimentation continually, and its effect on  
19 overwintering areas. I anticipated this question a  
20 little bit so I wrote a little bit about it. I'd just  
21 like to read it in, and relate the sedimentation  
22 basically to overwintering.

23 Q If you'd like, I can come  
24 to sedimentation later.

25 THE COMMISSIONER: I think that  
26 Mr. Steigenberger should read what he's written now.  
27 Let's do that. Carry on, sir, please.

28 A O.K. I state that I  
29 acknowledge that sedimentation and its effects have  
30 been delineated at many lengths throughout this Inquiry.





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I've heard it stated that it is difficult, if not impossible, to develop standards for construction. Other arguments are that it will be below those naturally occurring, and then below those naturally occurring and that's specifically for times of breakup.

There are also other instances that the levels during breakup are the highest that are recorded. I point out that one should not overlook the fact that during the winter, that the levels are usually the lowest and in most instances no suspended sediments are evident in a lot of these groundwater sources and water courses. Thus it appears that if you introduce it during winter construction, it could have an unknown effect.

I should like to point out that on the North Slope of the Yukon, winter is a critical time of the year. Fish are limited in some cases to isolated sources of water, these being again groundwater sources. The fish, through evolution, have survived and are adapted to this type of winter environment. In the case of fall spawners, the overwintering life stages of hatching eggs are at the mercy of both the levels and the duration of silt introduction. It has been stated that juveniles and adult fish can avoid sediment by displacing themselves at least through spacial distribution. However, I should point out that the extent of these groundwater sources are not large. Examples being that the Malcolm River when I saw it was about 300 feet long and 10 feet wide. Fish Creek at the



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1 mouth was under an aufeis area. It was about two to  
2 three feet deep of unknown extent. Craig Creek was  
3 100 feet by 10 feet.

4 It is my opinion that these  
5 areas are relatively slow, and in some cases have been  
6 shown to contain substantial numbers of fish and that  
7 sedimentation in a winter environment warrants detailed  
8 and further study.

9 On the other side of the coin,  
10 is increased sedimentation during the summertime. I'd  
11 just like to make a general comment on this. It  
12 is during this time that fish species must prepare  
13 themselves for the winter phase of the life cycle.  
14 Increased sediment has been shown to cause the movement  
15 of drift of organisms essential for an energy base which  
16 is basically stored to enable the fish to go through  
17 the critical winter period.

18 So if one accepts this assump-  
19 tion as being correct, I'd like to see again more  
20 mitigative measures, studies directed specifically  
21 towards sediment.

22 Q Mr. Steigenberger, before  
23 you leave the topic of sedimentation, can I put to you  
24 the observation that Dr. McCart made during his  
25 testimony, when he expressed his concern was not so  
26 much with respect to short-term sedimentation but long-  
27 term sedimentation. Would you comment on that?

28 A In this preparation here  
29 I said that both the levels and the duration of  
30 silt introduction were important.



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Q Yes, but how long is too long, is what I'm really asking?

A Well, I have before me a publication which I'll generally reference and verbalize on the suspended sediment loading, which is milligram, litres, days, and we looked at the percent survival of eggs in gravel, depending on the milligram litre load, and in this specific instance with rainbow trout from this report it shows that <sup>at</sup> 2,000 milligram litre days which could be 2,000 milligram litres in one day, or you could assume that it is 200 milligrams per day for ten days, the survival of eggs to emergent is in the order of magnitude of 5%. O.K., and this is done essentially in a hatchery incubation box setup, where <sup>if</sup> the fish were not subjected to sediment, the survival would be in the order of magnitude of 85 to 90% survival.

On the same page of this text here there is another figure that has the percent of sediment in the gravel by weight plotted against the percent survival to emergent, and where we get between 6 and 7% sediment in gravel, the survival of fish to emergent is in the order of magnitude of 5 to 10%. Where there is only 1% sediment in gravel, the survival on the line is 65%.

MR. MARSHALL: What is this report that is being quoted from, sir?

A Just verbal, the title of the report is:





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1 "Impacts of forest harvesting on streams in  
2 the Slim Creek Watershed in the Central Interior  
3 of British Columbia."

4 It was presented at a Forest, Soils & Stream Ecology  
5 Program in May, 1975. It was published under the  
6 British Columbia Fish & Wildlife Branch.

7 I'm not too sure that these  
8 are typical, and they could be extremes, but I go  
9 back to the point that the duration and the levels of  
10 silt introduction are important for maintaining ade-  
11 quate survivals that will maintain fish populations.

12 MR. RYDER: Q Sir, can I ask  
13 you what your comments are on siltation that may occur  
14 on an annual basis, or may occur once every three years  
15 as a result of further construction in an area for  
16 maintenance purposes, or for looping or perhaps for the  
17 completion of other development in the area? Long-term  
18 siltation in that sense.

19 A Well, if you accept that  
20 this figure is correct, the more milligram litres of  
21 days of silt introduction through time, the lower the  
22 survival rate is going to be.

23 Q Mr. Stein, do you have  
24 any observations on that question?

25 WITNESS STEIN: Concerning Mr.  
26 McCart's testimony?

27 Q Concerning the question of  
28 siltation that occurs perhaps annually or every two or  
29 three years for a period of years as a result of looping  
30 or as a result of repairs to the pipeline.



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1 A You're talking additive  
2 effects of siltation now, really.

3 Q Yes, but not in the  
4 terms that Mr. Steigenberger was first mentioning  
5 it. I am talking about additive effects over a period  
6 of years.

7 A Well, that is really  
8 what I am referring to and to my knowledge there has  
9 been no work done to assess the effect of what you  
10 might call chronic siltation.

11 Q Now, Mr. Steigenberger,  
12 at page 21 of your testimony, in paragraph four,  
13 sub-paragraph two -- or sub-paragraph one, rather,  
14 you state:

15 "If gravel removal from below the  
16 perimeter of the stream occurs, the  
17 following should apply."

18 And paragraph, sub-paragraph one states:

19 "The levels and duration of silt intro-  
20 duction are within the standards of the  
21 monitoring agency. "

22 Now, are the readings you gave us from the report you  
23 referred to, the kinds of standards you had in mind  
24 when you wrote that recommendation?

25 WITNESS STEIGENBERGER: This  
26 recommendation was written previous to the publication  
27 -- of the release of this documentation, but it was  
28 written anticipating that standards would be required  
29 to maintain the productivity of the system and the  
30 survival of fish.



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1 Q And I take it what  
2 you are saying is that more work needs to be done  
3 before the standards, the appropriate standards can  
4 be determined?

5 A Yes.

6 Q Are you familiar with --  
7 and is that your observation, Mr. Stein? Do you  
8 have an observation on that?

9 WITNESS STEIN: If I can make  
10 one general observation here. In my view I don't think  
11 that it is going to be possible to establish standards  
12 for the levels of sediment that, let's say, could  
13 be or should be allowed within a stream system, not  
14 unless you want to approach it again on an individual  
15 stream system basis. I made reference before to the  
16 variables that are encountered, including the abundance,  
17 locations and types of habitats; the species involved  
18 and their relative sensitivity; the characteristics  
19 of the stream bottom, the stream banks; the flow  
20 characteristics, and what you are really looking at  
21 is the ability, I think, of the stream to remove  
22 that sediment load, preferrably immediately, so I  
23 offer just my own opinion there that to come out and  
24 attempt to establish a standard level that you  
25 can, say, apply uniformly, be it in the -- well, I will  
26 restrict myself, that you can apply uniformly to the  
27 Mackenzie Valley, I don't think in my own opinion that  
28 it can be done and if it is done I don't think that it  
29 is a wise decision.

30 Q And are you referring to





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1 numerical standards?

2 A Yes, I am.

3 Q Are there any other  
4 kinds of standards that would consist in controlling  
5 sedimentation?

6 A I don't think I could  
7 give you other standards, sir, other than I say it  
8 should perhaps be a factor, if indeed you want to  
9 even discuss standards, it should be a factor of the  
10 ability of the stream to remove that silt load as  
11 quickly as possible. I think that we are all aware  
12 that we are in a very complex situation here and  
13 I think the best approach is probably to just make  
14 every effort to allow the absolute minimum level of  
15 silt to enter that system.

16 Q And in the absence of  
17 that utopia then, we are faced with sedimentation  
18 protection methods and precautions at almost every  
19 stream where you see fish using it?

20 A Ideally it would be  
21 done on an individual stream basis. I recognize the  
22 fact, sir, that having a standard would make life  
23 considerably easier, not only for the engineer, but  
24 for the enforcement officer. What I have attempted  
25 to do here, I think, in most instances, is to provide  
26 the operating guidelines that in my opinion, will,  
27 as I say, limit the silt levels, or should limit  
28 the silt levels in these streams.

29 Q Now, a second area  
30 that was mentioned by the panel, or identified as an



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1 area in which information was lacking, is the relation-  
2 ship between fish biology on the one hand, and the  
3 management of domestic and sport and commercial  
4 fisheries on the other hand, and there has been evidence  
5 given in this Inquiry that we can expect an increase  
6 in the use of the area made by people as a result of  
7 this development and other developments which may  
8 follow, and as a result of that, can I ask you, Mr.  
9 Walker, if you anticipate, in your region of the Yukon,  
10 an increase in all these fisheries, domestic sport and  
11 commercial, as a result of the increased access  
12 to the area that is anticipated?

13 WITNESS WALKER: Well,  
14 certainly the opportunity for increased utilization  
15 will exist with the improvement of access. Do I  
16 anticipate problems arising from this?

17 Q Yes.

18 A It depends upon how  
19 it is handled internally. As a biologist, of course,  
20 I will have measurements of population magnitudes and  
21 size compositions and selectivity information by  
22 year on those stocks, also timing, so that I am  
23 aware of what kinds of fish, what stage of life,  
24 what sex of fish can be taken by various fishing  
25 techniques, and I can make these, I can submit this  
26 kind of information into a recommendation as to  
27 how -- to the chief of the division, or his representa-  
28 tive -- as to my concerns on how you may regulate to  
29 take care of this increased exploitation. But I am in  
30 advisory capacity. All biologists are in this



1 connection.

2 Q Yes. Are there existing  
3 conflicts now between the three kinds of fisheries in  
4 the Yukon?

5 A Yes, there is.

6 Q And how are they resolved?  
7 How do you go about resolving these conflicts?

8 A Well, the conflict  
9 exists between commercial and sport fishing interests  
10 and this is in the south Yukon. We do not have  
11 that kind of problem in the North Yukon to my knowledge.  
12 Do you still want me to answer although it may be in  
13 the South Yukon?

14 Q Do you see these  
15 problems being aggravated by increased development?

16 A Certainly.

17 Q And do you have ideas  
18 as to how you are going to confront these problems?

19 A Yes, I do have ideas.  
20 We want to look at the biology of the particular  
21 species or stocks in question and we want to see how  
22 the desirable species for either fishery can be  
23 isolated from the other types of fisheries and this  
24 can be done either in type of fishing, -- in method  
25 of capture, excuse me, and in method of capture,  
26 time of year, place, and so on. So there are several  
27 kinds of data one can look at to attempt to resolve  
28 these conflits, short of closing out one group conflicts  
29 entirely.  
30





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1 Q Do you see any threat  
2 to the domestic fishery as a result of the increased  
3 use of fisheries in general, the increased harvest that  
4 you anticipate?

5 A There should not be, with  
6 proper legislation.

7 Q What do you mean by that?  
8 Would you set priorities between the fisheries?

9 A I would make recommendations  
10 and -- for certain actions to be taken, and if these  
11 were taken then I would expect the present resources to  
12 be protected, to be utilized and protected.

13 Q Well, in establishing  
14 these priorities which you would recommend, where does  
15 the domestic fishery sit in your system of priorities?

16 A Where does it sit? Well,  
17 it is equally important as <sup>the</sup> commercial fishery, I would  
18 say. All fisheries -- as a biologist, looking at  
19 management of the stocks to which we have a responsibility  
20 in terms of technical input, then I look at each fishery  
21 or type of fishery in isolation. I do not make a prefer-  
22 ential choice. That is done by those in higher authority,  
23 if there is a priority set.

24 Q Now, Mr. Stein, can you  
25 give us some help with respect to the position in the  
26 Northwest Territories? Do you foresee conflicts between  
27 the three types of fisheries in the valley?

28 WITNESS STEIN: I can see that  
29 a potential lies there, yes.

30 Q And in resolving the conflict



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1 which may be aggravated as you say by increased develop-  
2 ment, do you have any recommendations?

3 A Are we talking here now  
4 about the inter-relationships, or sorry, the sport-  
5 domestic-commercial fisheries and not specifically the  
6 sport fishing, say, that would be associated with the  
7 pipeline?

8 Q Well, I believe we are.  
9 I'm saying that as a result of the pipeline, and perhaps  
10 as a result of ancillary activities that there will be  
11 an increase in sport fishing, that there will be more  
12 people in the area which may increase the commercial  
13 fishing, and I'm concerned as to what effects this  
14 increased use of the other two fisheries will have on  
15 the existing domestic fisheries in the area.

16 A Well, as I say, in my  
17 opinion there is the potential that there will be  
18 conflict, obviously, between the three types of fisheries  
19 that I think we're talking about here. If and when that  
20 time comes I think that probably it will require --  
21 I'm talking now fairly long-term, but it will require  
22 changes in legislation, yes. There are other people,  
23 though, who as I think I made reference to this before,  
24 that when we start reaching this stage it's going to  
25 require some additional information to be placed in the  
26 hands of our management people, who have the responsibility  
27 for managing these stocks, and for changing the regula-  
28 tions. So now what I am talking about is that the  
29 -- as you recall, I mentioned trying to discern between  
30 the individual populations that we are now dealing with



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as one mass, and making proposals for the management of specific fisheries.

Q Now the third area baseline environmental information contains an information gap, at least I believe it does. The location of the sensitive areas which could be impinged upon by pipeline activity, and you'll agree with me that it is possible, for example, you Dr. Stein, have provided us on page 13 with a list of sensitive stream systems at the top of the page and I think from your evidence this morning you agree that it's possible that a stream may be itself sensitive in the sense that it provides habitat for important populations of fish; but that the sensitive area may not be impinged upon by the particular pipeline activity in the time when the activities take place. Have I summarized your position correctly?

A I think I follow you. Go ahead.

Q Now, starting from there it appears to me that of the perhaps 3,000 water bodies affected by the route from Prudhoe Bay to the 60th Parallel, that they can fall into three categories insofar as the information we know about them is concerned, and the first category is where we have identified the sensitive areas that will be impinged upon by the pipeline activity, at the time activity is to occur. The second category is where the sensitive area hasn't been identified but it hasn't been ruled out either; it's a possibility that a sensitive area may be impinged upon by the pipeline; and then there is a third category





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1  
2 of water bodies where we have every reason to believe  
3 positively that there is no important sensitive fish  
4 concern that could be affected by the pipeline activity,  
5 and can I ask you to, <sup>I</sup>take it you're all familiar with  
6 Dr. McCart's stream catalogue. Do you know the document  
7 I'm referring to? Do you, Mr. Steigenberger, know  
8 that document?

9 WITNESS STEIGENBERGER: Yes.

10 Q And do any other members  
11 of the panel have any familiarity with the document?

12 WITNESS STEIN: I am aware of the  
13 document, sir.

14 Q And can I just ask you  
15 if we can use the catalogue as a means of categorizing  
16 the various water bodies that are confronted by the  
17 pipeline into the three categories that I've mentioned.  
18 Is that catalogue sufficient for the purpose?

19 A I take it you're going to  
20 insist that we categorize them into those three groups.

21 Q Well, if you can think of  
22 a better categorization.

23 A No sir, I basically agree  
24 in general principle, at least, with your three categories,  
25 but I'm afraid that when you get down to your third  
26 category you may be overlooking something here,  
27 We have found that you can take the most minor tributary  
28 in the Mackenzie system and I think you can rule out  
29 the possibility of spawning and I'm talking generally  
30 again, you can probably rule out the possibility of



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1 overwintering but it seems inevitably that you end up  
2 with having one giant rearing area. So I would, you  
3 know, I'm not -- I wouldn't want those three categories  
4 to be used, is what I'm getting at, as sort of an  
5 indication that in the third category you've got no  
6 problems, just carry on.

7 Q Well, if you found an  
8 important rearing area, I assume it could be affected  
9 by the pipeline activity.

10 A Again I'm speaking in  
11 general terms and throughout our reports I think we  
12 have identified what we would consider to be most import-  
13 ant rearing areas, and I'm just pointing out that you  
14 can't say that these small tributaries are void of  
15 fish. O.K., am I silting the waters here?

16 Q Well then you're saying  
17 that there's no category 3?  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30



1 It is either a possible  
2 important area or a certain important area. I am  
3 sorry, I just don't understand you.

4 A Well, you are  
5 going to end up with a multitude of streams that  
6 fit into that third category within the Mackenzie  
7 Valley, and as a whole they are important.

8 THE COMMISSIONER: Oh,  
9 excuse me. I don't have the stream catalogue before  
10 me. Does it have a category for spawning, a category  
11 for migrating, a category for overwintering, but  
12 not one for rearing ?

13 A No, sir, the way I  
14 recall it, the catalogue has essentially provided  
15 a description of each system including habitat types,  
16 fish encountered, water quality and so on. I don't  
17 believe that it has categorized it, maybe Mr.  
18 Marshall has it --

19 MR. RYDER: The catalogue  
20 does not categorize the streams as I have suggested  
21 ought to be done, but what it does do, as I understand  
22 it, it identifies what we know about the use made of  
23 that partiucular stream by fish, whether it be spawning,  
24 rearing, overwintering or what have you. Is that  
25 how you understand the catalogue, sir?

26 A I am sorry, what was  
27 the last part of that?

28 Q The catalogue, as  
29 I read it, does not divide the streams crossed by  
30 the crossings into the various categories that we have





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1 described, but it does --

2 THE COMMISSIONER: -- in  
3 terms of the use that the fish make of the body of  
4 water. It doesn't categorize that, that is the point?

5 MR. RYDER: Yes, it does.

6 THE COMMISSIONER: It does --

7 MR. RYDER: -- describe  
8 the use made of the streams by fish.

9 THE COMMISSIONER: Well, what  
10 are we trying to find out from Dr. Stein, then?

11 MR. RYDER: Well, I am trying  
12 to find out from Dr. Stein if we can start with this  
13 catalogue --

14 A Sir, if I could just --  
15 I did say that generally I would agree with your  
16 three categories. I only wanted to point out that  
17 it would probably be fairly safe to say that any stream  
18 that is flowing into the Mackenzie Valley is going to  
19 have fish in it and I just didn't want these very  
20 minor tributaries to be just completely overlooked. I  
21 think you should proceed with your point here.

22 THE COMMISSIONER: All right.  
23 That is the point. We have got it, at least I have  
24 it, so everyone else must have had it long ago --

25 MR. RYDER: Well, that  
26 leads me to another question I didn't intend to  
27 ask, and that is assuming that you find a small  
28 tributary with fish in it, now, does that necessarily  
29 mean that protection is required? I mean, where do  
30 we draw the line? Do we draw the line at the merest



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1 presence of fish, or do we draw the line at some other  
2 place?

3 A I have drawn the line,  
4 as I say, a good portion of it has the relative  
5 abundance, because as I said, you are not likely to  
6 find many flowing streams in the Mackenzie without  
7 fish in them during -- I am talking of summer now,  
8 I should have qualified that a little bit more  
9 here earlier.

10 Q And can you help us  
11 by being more precise as to the level of abundance  
12 that you would consider important?

13 A I would have to define  
14 abundance, sir, relative to the other stream systems  
15 within that area.

16 Q So what you are saying  
17 is that this process of categorization would be very  
18 difficult and it may vary from biologist to biologist?

19 A I expect it would  
20 from biologist to biologist, yes.

21 Q Where do we come upon,  
22 where at the stage of final design -- the applicant  
23 propose to cross a stream where we do not have a  
24 great deal of local knowledge, and where you have  
25 a stream, in other words, which falls into the  
26 second category, where important fish habitat is  
27 expected, but not proven, then what is the approach  
28 that you, as a biologist, would have the pipeline  
29 company take?

30 A I take it you are



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1 talking here now about the actual time of crossing  
2 that stream?

3 Q Yes.

4 A Then I would fall back  
5 to the recommendation I had made in my testimony that  
6 if there is flowing water or sub-gravel water, they  
7 use a trenching technique that will incorporate the  
8 most effective sedimentation control devices or  
9 sytems, whatever, that can be built into the trenching  
10 design or scheme.

11 Q So you would begin  
12 with the assumption, the unproven assumption that  
13 the stream does contain important fish habitat?

14 A I would, yes.

15 Q And that would-- I should  
16 add the qualification to that -- that the stream not  
17 only contains important fish habitat, but that the  
18 area in which the habitat is, would be impinged upon  
19 by the pipeline?

20 A Yes.

21 MR. ANTHONY: I believe Mr.  
22 Steigenberger wanted to make a comment on this issue,  
23 too, if he may.

24 WITNESS STEIGENBERGER: I  
25 would just like to go back a little bit. At the  
26 onset of the question, and I believe you asked whether  
27 you could use a catalogue at specific crossings,  
28 one thing I would like to say about the catalogue is  
29 it is a compilation of all published data that is  
30 available to date, and in that sense it is a good





1 report. It falls short relative to pipeline construction  
2 in that if you have a given overwintering area in  
3 the system, the report gives no recommendations of  
4 what you are supposed to do when you get there with  
5 the pipe.

6 Q And the recommendations,  
7 I take it, would depend on the importance that the  
8 biologist placed on the stream identified in the  
9 catalogue?

10 A Yes.

11 Q Which comes down to a  
12 process of categorization of some kind?

13 A I believe that you have  
14 to establish a priority of how important it is to  
15 fish and then give the protective measures, or make  
16 recommendations when you put the pipe in the ground,  
17 of how you are going to protect the fisheries  
18 resource.

19 Q Now, we were discussing  
20 before lunch the problem of organizing, assimilating  
21 in one organized form, all of the information gathered  
22 by the government on the one hand from the various  
23 sources that government has provided information  
24 and by Dr. McCart and Mr. Hayden of Foothills  
25 on the other, and I take it it is the consensus of the  
26 panel that this process of organizing really can't  
27 be done at this stage of our deliberations and that  
28 it should be handed over to the authority that is  
29 entrusted with the responsibility of enforcing the  
30 terms and conditions that are attached to the grant of



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1 the right-of-way. Can I ask you for a reply on that,  
2 Mr. Steigenberger?

3 A I would agree to that.

4 Q Does any member of the panel  
5 have an exception to that or anything to add to Mr.  
6 Steigenberger's answer? All right.

7 Now, dealing with the problem  
8 of reviewing the applicant's final design at the time  
9 when it proposes to cross a river, if you, Mr. Stein ,  
10 had the job of reviewing the applicant's final  
11 design, can you provide us with the kinds of information  
12 which you would require the applicant to produce?  
13 Now, I have divided the activities of the applicant  
14 into a number of activities and if you are unable  
15 to comment or would prefer to wait and comment later  
16 in writing, perhaps, let me know, but the activities  
17 that I would like to comment on are first of all  
18 large river crossings in the summertime, for example,  
19 the Mackenzie and the Great Bear Rivers; secondly,  
20 for large river crossings in the winter time; and then  
21 thirdly, for those 400 odd stream crossings that the  
22 applicant has told us will not be accompanied by a  
23 site specific crossing design. Now, are you able to  
24 provide us with some guidelines now as to what in-  
25 formation you would require the applicant to produce,  
26 or would you like to wait and provide it later after  
27 you have had an opportunity to think about it?

28  
29  
30



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1 WITNESS STEIN: I'll take a  
2 start at it and see if I can add to it later.

3 Q All right.

4 A Well, I think there's a  
5 certain amount of what you may call baseline information  
6 that would be required for all of these. I would want  
7 to have a detailed list of the species utilizing the  
8 stream, their relative abundance, a detailed habitat  
9 analysis again both at and below the crossing, the timing  
10 of -- this would probably relate more to the summer  
11 crossing.

12 Q We're dealing now I  
13 take it with summer crossings.

14 A Well, again I would like  
15 to have some sort of an assessment of what the  
16 expected sedimentation impact is going to be. I think  
17 those three probably will be common to all crossing  
18 techniques or types. For the summer crossings I  
19 would want to see or to have an idea of the migration  
20 routes, the migration times for species that will be  
21 passing the crossing, if it, say, is going to be a dredged  
22 crossing I would like to have some idea of what or how,  
23 rather, these fish runs are going to react to the  
24 operation of the dredge; the deposition of silt, both  
25 from the trenching itself and from the spoil pile below.  
26 I would like to have some idea of the effects that a  
27 berm would be, if a berm is going to be used and I  
28 would include here both hydrological effects and whether  
29 indeed these hydrological effects are going to effect  
30 the migrations of fish.





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1 Q You're talking there about  
2 water velocities.

3 A Yes, yes. For large  
4 winter crossings I would assume again now that these  
5 have water flow in them. I would like to know what  
6 the flow rates are. I would like to know what the flow  
7 patterns are within the river. Again I think I did make  
8 reference to sediments and what the expected area in-  
9 volved is going to be. There would be a certain amount  
10 of water chemistry information, I think, of specially  
11 dissolved oxygen. I would like -- well, I have made  
12 reference to toxic analysis.

13 The third one I think I can  
14 just say that the minor stream crossings again, ideally  
15 I would like to have that habitat analysis complete  
16 even for those --

17 Q What do you mean by  
18 "habitat analysis"? What is involved in that?

19 A I am talking here now  
20 about, well for winter crossings specifically, over-  
21 wintering and spawning areas, and these would be  
22 spawning areas of these fall spawning species.

23 Q Would there be any different  
24 material for summer crossings? Does "habitat analysis"  
25 mean different things in summertime? Are you talking  
26 about the life cycles, the use made of the stream when  
27 you're talking --

28 A Yes, that's exactly what  
29 I'm talking about. In summertime you're going to have  
30 other uses as well. You're going to have eating habits,



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you're going to have different species that are spawning in that area as well so you may indeed end up with different spawning areas.

Q Do you have anything to add on the smaller streams that you're dealing with?

A Not other than I say that I would like to have an idea of what the crossing technique that is proposed, dependent on of course whether flowing water is encountered.

Q Thank you. Can I ask you the same question, Mr. Walker?

WITNESS WALKER: Mr. Stein has covered every point that I had listed here.

Q Thank you. Mr. Steigenberger, do you have anything to add to Mr. Stein's list?

WITNESS STEIGENBERGER: Terms of reference for construction within the Northern Yukon Territory in my understanding is limited to winter construction, and I think most of these topics are the types of things that we would like, <sup>are</sup> covered in my testimony, the last paragraph on page 25, through to page 28. The only thing that I might add is that it may be advantageous to continue studies to understand more fully the biology of the fish so that we can get some idea of how we can predict what the reaction is going to be in certain environmental impacts. I think that's all I have to say.

Q Can I ask the panel some questions with respect to gravel removal? As I understand the report by you, Mr. Stein, and Mr. Dryden, that deals



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1 with the guidelines for the protection of the fish  
2 resources of the Northwest Territories during highway  
3 construction and operation, at page 27 you have a  
4 recommendation for gravel removal, and then Mr. Steigen-  
5 berger at page 20 to 21 of your evidence you have  
6 recommendations for the removal of gravel and I take  
7 it that your recommendations are confined to the North  
8 Coast, and the Yukon. Am I right?

9 A I think it's a general  
10 principle though.

11 Q Well --

12 A It's based on observations  
13 from the Northern Yukon, yes.

14 Q Are the guidelines that  
15 you, or the recommendations that you provided, Mr. Steig-  
16 enberg, are they the current guidelines of the Pacific  
17 Region of the Fisheries Department?

18 WITNESS STEIN:  
19 A NO SIR, they are not. They  
20 are restricted to the Northwest Territories.

21 Q No, I meant Mr. Steigen-  
22 berger.

23 WITNESS STEIGENBERGER:  
24 A I think Mr. Walker should  
25 answer this question.

26 WITNESS WALKER: I would like  
27 to make clear that these guidelines were developed among  
28 ourselves, in consultation with people more knowledgeable  
29 on specific problems, and also those that have had some  
30 experience with pipeline construction and also other  
industrial activities in the South British Columbia, so  
we tried to utilizing their knowledge, we tried to





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1  
2 develop these broad guidelines to apply to the pipeline.  
3 But I wouldn't say that they're necessarily policy,  
4 although I have to admit that they are printed. It  
5 was, in other words it's the guidelines developed or  
6 designed by technical people like ourselves.

7 Q Is there in the Yukon  
8 compared to the Northwest Territories a different  
9 approach to the removal of gravel from streams?

10 A There may appear to be,  
11 but in that -- if there is a slight difference, or if  
12 it's been written differently, I believe it resolves  
13 around the active flood plain and flood plain fossil.

14 THE COMMISSIONER: You mean  
15 if there is a difference between the N.W.T. gravel  
16 removal restrictions and the Yukon's, it relates to the  
17 difference between the fossil flood plain and the active  
18 flood plain, is that what you're saying?

19 A I think, sir, it has been  
20 written maybe slightly differently but this can be  
21 resolved in working it out among ourselves. Let's  
22 get together and form a general policy.

23 THE COMMISSIONER: Let's stop  
24 for coffee then.

25 MR. RYDER: We can form the  
26 policy over coffee.

27 (PROCEEDINGS ADJOURNED FOR A FEW MINUTES)  
28  
29  
30



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(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: Well,  
Mr. Ryder, do you want to start in with the survivors  
of that panel?

MR. RYDER: Well, perhaps  
then, Mr. --

MR. ANTHONY: Mr. Commissioner,  
I think Mr. Millen wanted to make a comment to clarify  
the issue that was raised before coffee and I will  
see if I can round up the other panelists.

WITNESS MILLEN: On the  
question of gravel removal, I would like to point out  
that there is a difference, a slight difference in the  
way the regulations are set out for the two territories,  
the Yukon Territory and the Northwest Territories, and  
in addition there are some differences in the precedents  
that have been established in the way in which  
gravel removal is being controlled in the two territories  
and this has given rise to the preparation of somewhat  
different recommendations as to the control of  
gravel removal in the two different areas. In  
essence the history of gravel removal in the Mackenzie  
Valley is that gravel removal from streams has been  
very strictly controlled and in fact very seldom  
permitted. In the Yukon Territory, because of their  
history of placer mining and so on, the interference  
in streams has been quite extensive and subsequently  
gravel removal from streambeds has in fact been per-  
mitted.

We feel, and when I was working



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1 for the Fisheries Service in this area, that we were  
2 expected to maintain what has been established  
3 by precedent in this area and continue to be  
4 extremely stringent about the removal of gravel  
5 from streams, and the slight differences in the  
6 wording of the regulations, probably reflects this.

7 MR. RYDER: Now, can I go  
8 back to you, Mr. Stein, and your guideline for the  
9 protection of fish resources of the Northwest  
10 Territories during highway construction and operation  
11 and when guideline number -- your guideline on  
12 page 27 was put to Dr. McCart, he said at page  
13 12480 of the transcript in an answer:

14 "It is the appropriate sort of guideline  
15 for the Mackenzie Valley, but it is not  
16 appropriate to braided streams on the  
17 North Slope."

18 Now, perhaps you, Mr. Steigenberger, should comment  
19 on that. That is your area and we have from Dr.  
20 McCart that the guideline proposed in the Dryden  
21 and Stein report aren't appropriate for your area.  
22 What do you say about that?

23 WITNESS STEIGENBERGER: I am  
24 afraid that I cannot answer that question.

25 Q Mr. Stein, do you have  
26 any observations?

27 WITNESS STEIN: Obviously  
28 I am speaking out of my territory. The only reason  
29 I could see for basing that would be the physical  
30 nature of those streams, but I certainly couldn't





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1 comment beyond that.

2 Q Now, Mr. Steigenberger,  
3 my one last question on gravels is to you, and on  
4 page 20 and 21 of your evidence you list some of  
5 the conditions that should apply to gravel removal  
6 from below the high watermark and above the wetted  
7 perimeter.

8 Now, are you thinking here in  
9 that part of your testimony of the kind of gravel  
10 operation that Arctic Gas has proposed on some North  
11 Coast braided rivers where pits would be opened in  
12 autumn on gravel bars that are dry at that time of  
13 year and separated from the active channels by some  
14 form of buffer zone, is that what you are addressing?

15 WITNESS STEIGENBERGER: Yes.

16 Q All right, now, in your  
17 recommendations you emphasize the importance of  
18 preparing an inventory of gravel supplies for these  
19 kinds of pits. Now, you talk about quotas to be  
20 established.

21 A Yes.

22 Q Now, can you explain how  
23 one should go about establishing inventories and  
24 establishing quota levels? What would be the basis  
25 of doing so?

26 A I think you would have to  
27 have an engineer go out there and actually drill it  
28 and measure it to find out how much is there.

29 Q And so what you are really  
30 looking for is, at the end of the day, sufficient gravel



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1 supplies to support the fish populations that may use  
2 it subsequently?

3 A Would you rephrase that,  
4 please?

5 Q Well, the reason for  
6 establishing your quotas and your inventories is so  
7 that after the gravel operation has been completed,  
8 there will be sufficient gravel left to support the  
9 fish populations that are apt to use the area.

10 A Well, yes.

11 Q Now, so it is a question  
12 which an engineer can't decide on his own. He needs  
13 the assistance of a biologist?

14 A I state in these things  
15 that for each crossing site establish a safe  
16 quantity of gravel for the continued maintenance of  
17 a fisheries resource on a long-term basis," so that I  
18 think you would have to have some fisheries input into  
19 that gravel removal, yes.

20 Q Now, can I turn to you,  
21 Mr. Millen, for a few questions, and at page 4 of  
22 your evidence you list a number of the items to be  
23 addressed in the environmental design of every minor  
24 stream crossing. Now, we have asked similar questions  
25 to other members of the panel, and you have listed them  
26 for us on pages four and five, and I was wondering if  
27 you could assist us with respect to some of these  
28 items now, either now or later if you prefer to take  
29 some time over it, as to what engineering techniques you  
30 were thinking of that might be useful, that might be



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1 employed by the applicants with respect to each of  
2 the activities that you've listed on pages four and  
3 five?

4 WITNESS MILLEN: I am afraid  
5 that a proper answer to that would be a very full  
6 description which I don't -- wouldn't like to attempt  
7 to do, you know, offhand, as it were. If you would  
8 like a further amplification I could probably do it.

9 Q Well, it would be  
10 useful for us because for one thing I am not sure that  
11 we have before us all the engineering techniques that  
12 are available and have been developed to date and I  
13 would like to have your views as to what engineering  
14 techniques might be used in this project for the  
15 various activities that you listed. Could you do that  
16 for us?

17 A I am sorry, I am  
18 rather reluctant to undertake to do that. The con-  
19 struction plan of Arctic Gas spends quite a considerable  
20 part of one volume on this topic and certainly I would  
21 have to start from that and add what I felt was appro-  
22 priate and I can't do it right now.

23 Q Well, we are not asking  
24 you for it now. I am saying that if the job requires  
25 more time and thought, then perhaps you could do it  
26 at your leisure.

27 A Yes, certainly --

28 MR. MARSHALL: He would  
29 seemly have no leisure left.

30 A Yes, perhaps I could.





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1 MR. RYDER: Well, it is a  
2 technique that we have developed when we have before  
3 us a panel of the applicants and we're probably  
4 falling into our same habits with you, but it is just  
5 to ensure that we have your views as to the available  
6 engineering techniques that might be employed.

7 Perhaps I could discuss it  
8 with Mr. Anthony and Mr. Millen.

9 MR. ANTHONY: I think perhaps  
10 it would be worthwhile to deal with this outside in  
11 a little more detail. I am concerned that Mr. Millen  
12 will be asked to undertake a task of -- doing the  
13 engineering design covering all the possible issues  
14 that these general guidelines raise, and I am sure  
15 that is not what Mr. Ryder's requesting, and perhaps  
16 we could discuss it and if there is any problem  
17 we can come back and advise you at a later date as  
18 to what we feel we can come up with to assist the  
19 Inquiry without being unfair to Mr. Millen.

20 MR. RYDER: Now, Mr. Millen,  
21 some other questions for you with respect to ice  
22 bridges. Now, the applicant has proposed, both  
23 applicants have proposed removing these in spring  
24 prior to the breakup so that there will be no blockage  
25 to fish passage at that time, and do you have any  
26 observations on the methods that ought to be used  
27 by the applicants in breaking up the ice bridges?

28  
29  
30



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1                   A     Well, I would say that  
2     this requirement to remove ice bridges and snow fills  
3     in gullys as well, which serves the same purpose, is  
4     required now in the winter operations that are conducted  
5     in the valley, and the operators concerned have some  
6     experience with this. In the case of ice bridges over  
7     large flowing rivers, I don't believe this is always  
8     done. The particular problem is -- arises when, in order  
9     to cross a large flowing river before it is frozen with  
10    a cover sufficient to carry a caterpillar tractor, they  
11    reinforce the crossing, as we <sup>in</sup> Fisheries Service have  
12    allowed them to do, with logs, and this structure can  
13    be extremely difficult to remove.

14                   To remove the crossings across  
15    the smaller streams which may be -- and normally are  
16    just ice increased in thickness over the natural  
17    thickness or snow filling in a gully is not normally  
18    a problem to a caterpillar tractor.

19                   Q     Excuse me, I'm sorry.

20                   A     These smaller crossings  
21    don't normally present any problem to a dozer operator.

22                   Q     O.K. From the evidence  
23    we've had so far, it seems that the timing of the re-  
24    moval of these bridges is very critical.

25                   A     Yes indeed it is. The  
26    operator is always reluctant to remove his bridges  
27    before he has to, and really all it amounts to is  
28    the effective length of the operating season that  
29    he's allowed to use it. If the operator is not pressed  
30    for time, there is no difficulty with it.



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1 Q So if you remove it too  
2 late, as the operator might be included to do, then  
3 you will tend to block fish runs. You agree with that;  
4 and if you remove it too soon you will be doing so  
5 at a time of low flow when the effects of siltation  
6 are most damaging. Is that the problem with respect to  
7 timing?

8 A Well, that's the problem  
9 from the fisheries point of view, but the operator  
10 normally has other problems as well, of keeping his  
11 operation going as late as he can.

12 Q So the removal of snow  
13 and ice bridges then would be one other item which you  
14 would cast to a judgment of a Fisheries monitor, or  
15 Fisheries enforcement officer.

16 A Yes, I believe this is a  
17 good example of a problem where judgments have to be  
18 made in the field at the time that the problem arises.

19 Q Now at page 19 of your  
20 evidence, Mr. Stein, you refer to the need to monitor  
21 during the construction stage and the need to monitor  
22 during the operational stage. Can you just briefly tell  
23 us what the environmental parameters are that ought to  
24 be monitored in both these stages?

25 WITNESS STEIN:

26 A I don't know if I could  
27 do it briefly. I think if I could just throw them out,  
28 I don't know if I could keep them in mind here and still  
29 break them down into the construction-operation phase.  
30 I think a lot of them will be equally applicable anyway.

I think that there should be some





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sort of monitoring of fish migrations at the time, I'm talking now of construction obviously. I think I'm kind of aiming this at the unforeseen, in other words we have observed considerable variation in the timing of migrations and if such a change should happen from the norm during the time of construction, I think the operation should be aware of it. I think in the case of highway culvert crossings or road culvert crossings, there definitely needs to be some monitoring to ensure that fish are not being blocked at those culvert sites. There should be monitoring of sediment levels, I think, as well as certainly some monitoring of water quality such that should spills or whatever be occurring, that the applicant is alerted to it as quickly as possible.

There certainly would have to be monitoring of the crossing sites themselves. This, I guess, you might call an operational monitoring; to ensure the success of the stabilization methods that have been incorporated at those crossings, and of course that goes hand in hand with the stabilization and the integrity of the pipe. There should be monitoring of gravel operations, I think both during the operation itself, as a protection against, let's say, avoidable siltation or increased siltation, as well as after the completion of that operation to ensure that indeed fish are not being entrapped in depressions and that stream flows have not been altered in such a way that you are affecting the stability of the stream itself. There probably should be some sort of monitoring to ensure that (if you can call this monitoring) that



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1 policy the applicant applies to prevent sport  
2 fishing that is indeed being effective. I think  
3 there should be some sort of a monitoring program on  
4 open water or overwintering sites. I guess this, while  
5 there would be a sedimentation factor in here of course,  
6 but I think really this may be more important in  
7 regards to water use if indeed water is being extracted,  
8 to ensure that these areas are not, say, being drawn  
9 down or dried up more than was indicated in any sort  
10 of an environmental or impact assessment, rather.

11 Q Do you have anything to  
12 add to that?

13 A The only other thing I  
14 think I could say is there obviously should be some  
15 sort of monitoring at the time to ensure that that  
16 crossing is being constructed in the manner which was  
17 approved, in the approving of that final design package,  
18 and I would say that this would also include such  
19 things as ice roads, which Mr. Millen has referred to.

20 Q Does any other member  
21 of the panel have anything to add to the list that  
22 Mr. Stein has given us? Mr. Walker?

23 WITNESS WALKER: One category  
24 I would add is resource use by all types of fisheries.

25 Q I see. Mr. Steigenberger,  
26 do you have anything to add?

27 WITNESS STEIGENBERGER: Just  
28 a general comment extracted from page 24 of my  
29 testimony, in my last paragraph. This is just to emphasize  
30 that you don't have to be site specific. It says, and



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I quote:

"To date a large number of reports have been published,"

and I'd like to point out that these are both industry and government,

"and each has considered many aspects of pipeline construction or disturbances and the life history stage of spawning, migration, overwintering, and rearing of fish that would be affected by pipeline construction. Some additional information on effect on invertebrates is also available."

This is specifically for the Mackenzie Delta, a lot of it.

"In all of these reports,"

and again I'd like to stress both industry and government published reports,

"many detrimental effects have been postulated, and many recommendations by government and by industrial agencies have been put forth. "

It says:

"Hopefully the published recommendations will be heeded because the statements put forth by competent people trying to minimize impact, and used to formulate stipulations that will be incorporated into the design prior to construction."

It also goes on to say:

"It should be emphasized that every effort must be made to schedule construction phases to minimize disturbances to aquatic resources."





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Ryder

1 In another section of my testimony I've also noted that  
2 within the recommendations published by both government  
3 and industry, there are apparent conflicts and these  
4 conflicts have to be resolved by some form or agency,  
5 group, and evaluated and then either justified, incor-  
6 porated, and if they're found suitable, implemented.

7 (REPORT OF RENEWABLE RESOURCES, DECEMBER 1975,  
8 MARKED EXHIBIT 387)  
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1 I think we need a total  
2 evaluation of all the recommendations and some  
3 decision made on all of them.

4 Q Now, that changes the  
5 subject somewhat, Mr. Steigenberger, but dealing with  
6 that topic, would you also include in the work that  
7 this committee is to do, the assimilation of all the  
8 various recommendations by your panel which we have,  
9 you have given us the Bryon recommendations, you have  
10 got recommendations of your own, Mr. Stein has given  
11 us some of his own, there are other recommendations  
12 by other members of the panel, so what you are saying  
13 is that the recommendations from all sources have  
14 to be assimilated and consolidated and the overlaps  
15 corrected, and I take it what you are saying is that  
16 this process should be done by -- one of the terms  
17 and conditions that the Inquiry should recommend is  
18 that this process should be undertaken, so that --by  
19 perhaps the enforcement agency or whoever is responsible  
20 to the job of enforcing, do I understand you?

21 A Yes.

22 Q But you don't propose  
23 that that process can be adequately done now because  
24 it is such an ongoing affair?

25 A Well, there is more  
26 information becoming available every day. Dr. McCart  
27 informed me yesterday that volumes 16 to 34 of the  
28 Biological Report Series have just been released. There  
29 has to be some mechanism to evaluate those and I don't  
30 think on an individual basis we have the time and/or the



1 capabilities to do it.

2 Q Well, now, insofar as  
3 those recommendations have to be sorted out, in order  
4 to prepare terms and conditions for this Inquiry, should  
5 they not be done by a panel of fish experts as opposed  
6 to, say, from our side we would ask Dr. Fyles to do  
7 it and Mr. Anthony may have somebody else to prepare  
8 his argument -- shouldn't it be done by a grouping  
9 of fish experts?

10 And as Dr. Fyles says,  
11 such as those that are sitting before us today.

12 A I think that we can  
13 only have partial input because it is multi-disciplined  
14 and there are going to be, at some time in the future,  
15 possible trade offs.

16 THE COMMISSIONER: Mr. Ryder,  
17 where is this getting us?

18 MR. RYDER: I would hope that  
19 it was getting us to terms and conditions.

20 THE COMMISSIONER: Well, Mr.  
21 Steigenberger has listed a whole series of terms and  
22 conditions and if I may be forgiven for saying so, they  
23 are site specific and now you are asking him to construct  
24 a tribunal to determine whether his recommendations ought  
25 to be accepted. He says, well, it is multi-disciplin-  
26 ary, and we will have to make some tradeoffs. Let's  
27 stick to fish.

28 MR. RYDER: All right. The  
29 difficulty that I see and why I deal with this point,  
30 Mr. Commissioner, is that if we accept all the terms and





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Ryder

1 conditions now that we have before us and list them  
2 and include them as terms and conditions, we are going  
3 to have a series of conflicting terms and conditions.

4 THE COMMISSIONER: Oh, of  
5 course, and presumably if Arctic Gas and Foothills  
6 don't like the conditions that have been laid down  
7 by these gentlemen, they will call evidence to  
8 establish the unsoundness of any or all of those  
9 proposed terms and conditions. If they don't adduce  
10 any evidence, then it is up to counsel at the time  
11 of final summation to tell me which, in their view,  
12 I ought to accept and which reject. The machinery  
13 that you can devise to lay down terms and conditions  
14 is going to be imperfect no matter what, and so are the  
15 terms and conditions.

16 MR. RYDER: Well, I simply  
17 don't have the same faith in the process of lawyers  
18 arriving at a series of terms and conditions as I  
19 do have in this panel, for example, but I won't press  
20 that point unduly.

21 THE COMMISSIONER: Well, don't  
22 the members of this panel agree on the things that  
23 each of them has said? They are not fighting among  
24 themselves as far as I can tell.

25 MR. RYDER: Well, perhaps  
26 I could ask them. Do you see conflicts or overlaps  
27 arising from the collection of all your terms and  
28 conditions, or all your recommendations? I mean, I  
29 take it that they weren't prepared with the view to  
30 harmonizing them one against the other. Mr. Stein, you



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Ryder

1 appear about to give an answer.

2 WITNESS STEIN: Personally  
3 I see very few areas of conflict within our individual  
4 terms and recommendations. It should be pointed out  
5 of course that we are dealing with the North Slope and  
6 we are dealing with the Mackenzie Valley, each of  
7 which we are -- what I am trying to say is relatively  
8 unknown to the territory of the other, so I think  
9 it is obvious that where variations do occur they  
10 were incorporated for that specific area that was  
11 being dealt with.

12 I think overall, looking at  
13 it from just a pure point of view of a biologist, I  
14 think that they were developed and submitted with  
15 really the same objectives in mind.

16 Q All right. Now, Mr.  
17 Millen, earlier today you -- two questions put  
18 to you by Mr. Marshall -- agreed that the role of  
19 enforcing the terms and conditions should be  
20 cast to a single authority to avoid the administrative  
21 nightmare of a collection of various regulatory bodies  
22 which may have some jurisdiction in the area. Do you  
23 recall that answer?

WITNESS MILLEN:

24 A Yes, I do.

25 Q Now, I wanted to just  
26 discuss with you the implications of that. Do you  
27 mean by that, that the authority which fisheries  
28 personnel have under the Fisheries Act would be  
29 suspended in the area covered by this project?

30 A No, I don't believe that



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Ryder

1 that is what I meant.

2 Q How would you harmonize  
3 the existing regulations and law with those terms  
4 placed on the right-of-way?

5 A Well, I would be  
6 very surprised if the terms were in direct conflict  
7 with any provision of the Fisheries Act. They may  
8 be an addition to the terms and the requirements of  
9 the Fisheries Act, but I can't imagine that they would  
10 undermine the Fisheries Act.

11 Q Now, this morning you  
12 were speaking of the ways of administering this  
13 enforcement role and I wonder if you had any thought  
14 as to what function the administrators of this enforcement  
15 role would have with respect to the existing fisheries  
16 legislation. Would they leave that to others and  
17 just enforce the terms and conditions or what?

18 A No, I would see that  
19 it would be necessary for the personnel primarily  
20 responsible for enforcing the Fisheries Act to be  
21 working within the authority, but I would see that  
22 they could still use the powers of the Fisheries Act.

23 Q So they would in  
24 effect, permission under the terms and conditions could  
25 be treated by these fisheries people as approval, as  
26 whatever approval may be required under the Fisheries  
27 Act so that the two different jurisdictions  
28 could be administered singly?

29 A Yes, I am sure that  
30 they could. This kind of procedure is already generally





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Ryder

1 adopted in the Northwest Territories. I pointed out  
2 in my testimony that the Fisheries Act does not in  
3 general require permits or approvals and comprises mainly  
4 prohibitions and things that must not be done.

5 In the Northwest Territories at the moment/<sup>when</sup>a water  
6 licence is issued that quite typically carries some  
7 provisions that are in there to protect the fishery  
8 resource, and these provisions then are checked on  
9 by fishery officers and if the Fisheries Act is  
10 in fact violated, there is always the possibility  
11 of a prosecution being laid.

12 Q And that appears to  
13 work satisfactorily?

14 A Yes, it does work.

15 Q One last question and  
16 that relates to the location of wharf sites and we  
17 have it from Mr. Hemstock on page 14087 where I  
18 quote:

19 "With regard to the location of the wharf  
20 sites we do have a fair bit of flexibility  
21 in the location of these sites. "

22 Now, this morning, you, as a panel, were addressing  
23 the problems of locating wharf sites near or at the  
24 mouths of rivers, and I believe one of you mentioned  
25 that, as a result of the Mackenzie Highway construction,  
26 a recommendation was that a highway crossing be located  
27 some 1500 feet upstream as a minimum distance from the  
28 mouth of the river. Is that the kind of guide that  
29 would assist us for pipeline crossings? -- Rather  
30 for wharf locations?



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Ryder

1 A It seems to me that  
2 you have mixed two concerns there. The pipeline  
3 crossing with the wharf site --

4 Q I didn't mean  
5 pipeline crossings I meant to refer to location of  
6 wharf sites.

7 Now, you have mentioned  
8 this morning that the location of highway crossings  
9 should be 1500 feet away. Now, we're dealing today  
10 with wharf sites and what is your view as a panel  
11 as to the distance that wharf sites should be moved  
12 away from the mouths of rivers?

13 A I originated that in  
14 the discussion this morning and I believe that that  
15 distance has some reasonable relevance in judging  
16 whether a wharfsite is too close to a stream mouth.  
17 Perhaps the rest of the panel could also comment on  
18 that.

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Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Ryder

Q Now when you say 1,500 feet, are you referring to a distance up the tributary stream, or up the main, up the Mackenzie River?

A No, certainly the wharf site has to be on the Mackenzie River and away from the mouth of the stream so that the distance would be measured in that case along the bank of the Mackenzie River.

Q Does that appear acceptable to the rest of the panel?

WITNESS STEIN: I would say that as a general guideline I think it would be feasible. I think again it would have to come down to a site specific river mouth, and the actual configuration of that river mouth, considering such things as what additional back eddys, etc., may be actually within the area. From my point of view I would say that as a general guideline it would probably appear satisfactory.

Another thing too is -- maybe this isn't relevant, but a lot of the Mackenzie River mouths are well indented, if you follow my meaning. It's not just a matter of a tributary coming down and dumping directly into the Mackenzie River, in which case that 1,500 feet figure would actually apply to the point where the riffle say of the stream dumps into that mouth portion which may put it even indeed that much farther back from the Mackenzie, so there are, you know, the characteristics of each stream mouth I think should play a part in this too. Do I make myself clear on this?





Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Ryder  
Cross-Exam by Hollingworth  
Q Yes, so what you're

saying is that that's something else to be decided on  
a site specific basis when you come to final design.

A I think it would be  
advisable, yes.

Q Using the 1,500 feet as  
a general guideline.

A That would appear  
satisfactory to me.

MR. RYDER: Thank you very  
much. I've finished, Mr. Commissioner.

THE COMMISSIONER: Well, any  
re-examination?

MR. ANTHONY: No re-examination,  
Mr. Commissioner.

MR. HOLLINGWORTH: Could I just  
get one point clear, Mr. Commissioner?

CROSS-EXAMINATION BY MR. HOLLINGWORTH (CONTINUED):

Q Mr. Stein, on that last  
exchange, I understood Mr. Millen to say that he felt  
that as a general guideline wharf sites should be at  
least 1,500 feet up or down the Mackenzie from the  
mouth of the tributary coming into it. Then you started  
speaking about the mouths of these streams being quite  
wide, and from what you said after that I rather gathered  
the impression you thought the force might be up the  
tributary. Is that what you meant to say?

WITNESS STEIN: No, no, that  
was not what I was getting at there. I was just trying



Stein, Walker  
Steigenberger, Millen  
Cross-Exam by Hollingworth

1 to point out the fact that there is considerable  
2 variation in the actual physical description, if you  
3 will, of each of these stream mouths, so that I was  
4 just pointing out the need that in a lot of cases to  
5 take this as a site specific examination as well.  
6 Certainly not taken from the approach that the wharf-  
7 site would be, you know, in the mouth itself, say.

8 MR. HOLLINGWORTH: O.K.,  
9 thanks.

10 MR. ANTHONY: Mr. Commissioner,  
11 that's all then for this panel, unless anyone else  
12 has anything.

13 THE COMMISSIONER: Well, the  
14 panel is excused then and I want to thank all of you,  
15 Mr. Stein, Mr. Walker, Mr. Steigenberger and Mr. Millen,  
16 for coming and giving us the benefit of your knowledge  
17 and experience. We do appreciate it and I have found it  
18 extremely helpful. So does that complete the evidence  
19 that we have available to be heard today?

20 (WITNESSES ASIDE)

21 MR. ANTHONY: Mr. Commissioner,  
22 the next panel is the panel of Dr. Lent and Dr. Calef .  
23 on caribou. Both these gentlemen are here and we can  
24 commence with the introduction of them and their  
25 evidence, if that's --

26 THE COMMISSIONER: Well, let me  
27 just ask you this, Mr. Anthony. Is it necessary, if  
28 we have to start this afternoon in order to complete  
29 their testimony by five o'clock tomorrow, fine; but if  
30 not, I'd just as soon leave it till the morning we



1 get a fresh start and we're all a little --

2 MR. BAYLY: I would hope that  
3 we could at least hear the direct evidence this evening.

4 THE COMMISSIONER: This  
5 evening?

6 MR. BAYLY: Sorry, well it is  
7 dark, this afternoon.

8 THE COMMISSIONER: All right,  
9 all right. Well, let's stretch our legs for five  
10 minutes and the panel can assemble themselves.

11 (PROCEEDINGS ADJOURNED FOR FIVE MINUTES)





Calef & Lent  
In Chief

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. MARSHALL: Mr. Commissioner, in an undertaking given by Mr. Hemstock, I've left with Miss Hutchinson for filing and distributed to counsel two preliminary logic digrams describing the manner in which the sites of a major line break or washout would be accessed by the repair crew. They also describe the manner in which the more important tasks at the repair sites are carried out. These drawings are preliminary in that they do not describe all the tasks necessary to the completion of the repair. I believe this is what Mr. Scott was requesting, and perhaps in due course when he's had a chance to examine them he could let me know whether or not that satisfies his request, and whether or not he requires that we furnish witnesses to speak to them. Thanks.

THE COMMISSIONER: O.K.

MR. ANTHONY: Mr. Commissioner, we'd now like to move onto the next panel that the Canadian Arctic Resources Committee would like to present to the Inquiry. This panel is composed of Dr. George Calef and Dr. Peter Lent, and I propose to have each of them introduce themselves and then Dr. Lent to present his evidence first.

THE COMMISSIONER: All right.

GEORGE WALLER CALEF,  
PETER CHARLES LENT, sworn:

DIRECT EXAMINATION BY MR. ANTHONY:

Q Dr. Lent, your biographical



Calef & Lent  
In Chief

1 note has been circulated with your statement of  
2 evidence. Would you please summarize that note and  
3 indicate your educational experience and background?

4 WITNESS LENT: Yes, I received  
5 a Bachelor of Arts degree from the University of  
6 Alaska in biology in 1960, and a Ph.D. from the  
7 University of Alberta in 1964 in zoology. My dissertation  
8 dealt with caribou behaviour, with particular emphasis  
9 on calving and post-calving behaviour.

10 From 1960 to 1962 I was  
11 employed by the University of Alaska on the bio-enviromental  
12 studies relating to Project Chariot. I was  
13 responsible for the caribou studies. This undertaking  
14 was a prototype of major environmental impact assessments  
15 in the north, in this case related to a proposed detina-  
16 tion by the Atomic Energy Commission of a nuclear  
17 device on the North-west Coast of Alaska.

18 From 1964 to '66 I was employed  
19 as a lecturer in zoology at the University of Botswana,  
20 Lesotho & Swaziland in Southern Africa.

21 In 1966-67 I was assistant  
22 professor of biology at Memorial University of Newfound-  
23 land.

24 '67-68 I was assistant professor  
25 of biology at the Adelphi-Suffolk College in New York.

26 From 1968 until the present I  
27 have been the assistant leader of the Alaska Co-Operative  
28 Wildlife Research Unit and a member of the faculty at  
29 the University of Alaska, associate professor of  
30 wildlife management since 1970.



Calef & Lent  
In Chief

1 My professional activities  
2 since 1968 have included work in the Arctic and sub-  
3 Arctic of Alaska, particularly behavioural and ecologi-  
4 cal studies of muskoxen and participation in research  
5 with caribou, moose and foxes, relevant to the impacts  
6 of northern development on these species.

7 I am a member of several  
8 professional organizations, including the Animal  
9 Behaviour Society, American Society of Mammalogists,  
10 Ecological Society of America, I'm a fellow of the  
11 Association for the Advancement of Science, a member of  
12 the Wildlife Society. I am also vice-president of the  
13 Alaska Conservation Society, a citizen's group with a  
14 membership of approximately 1,000.

15 Q And you are the author or  
16 co-author of a list of publications circulated with  
17 your biographical notes.

18 A That is correct.

19 MR. ANTHONY: Mr. Commissioner,  
20 I would submit Mr. Lent's biographical notes, reports  
21 referred to, and statement of evidence as the next  
22 exhibit.

23 Q We turn then to you, Dr.  
24 Calef. Similarly your biographical note was circulated  
25 with your statement of evidence. Would you please indicate  
26 your education, experience and background?

27 WITNESS CALEF: Yes. From the  
28 years 1960 to 1964 I attended the University of Chicago  
29 where I obtained a B. Sc. in zoology. From 1965 to 1966  
30 I was a research assistant at the Woods Hole Oceanographic





Calef & Lent  
In Chief

Institution in Woods Hole, Massachusetts where I carried out research on systematics and ecology of zooplankton.

From 1966 to 1967 I did further graduate studies in zoology at the University of Chicago, and 1967 to 1971 I was a graduate student at the University of British Columbia in Vancouver where I obtained a Ph.D. in zoology in 1971.

From 1971 to 1974 I was a biologist with Inter-disciplinary systems Limited, a consulting company in Winnipeg, Manitoba. I carried out environmental studies for the Environment Protection Board, which is an intervener at these hearings, which included two years of field work on the Porcupine caribou herd, and I also assisted with planning and field work of other studies of mammals and birds.

From 1974 to 1975 I was a resource person with the Canadian Arctic Resources Committee of Ottawa, Ontario, who assigned me to work with the Committee for Original Peoples Entitlement in Inuvik, where I helped with the design and participated in their pipeline information program in the communities.

I am presently a research scientist with the Fish & Wildlife Service of the Northwest Territories Government in Fort Smith, where I'm conducting studies on the ecology and behaviour of bison and wolves, and I guess I must add here that I'm not appearing as a representative of the Territorial Government, and the work on caribou which I carried out was not done under the auspices of the Territorial Government.



1 Q Dr. Calef, you are the  
2 author or co-author of the reports circulated with  
3 your biographical note?

4 A Yes, I am.

5 MR. ANTHONY: Mr. Commissioner,  
6 the biographical notes, reports and statement of  
7 evidence of Dr. Calef will be given the next exhibit  
8 number.

9 Q Dr. Lent if we could  
10 then turn to you and ask you to make your presentation  
11 to this Inquiry.

12 WITNESS LENT: Thank you.  
13 Before I begin my presentation I would like to  
14 emphasize that this is a personal testimony and that  
15 I am not here representing any U.S. institution, or-  
16 ganization or government agency.

17 My presentation to this  
18 Inquiry is divided into two sections. The first  
19 section is a discussion of certain aspects of  
20 caribou biology which have not received adequate treat-  
21 ment in testimony to date and which are particularly  
22 relevant to the Arctic caribou of Alaska and the  
23 Yukon Territory. I will not address myself to any  
24 details regarding caribou on taiga winter ranges  
25 primarily because I have feeling that these aspects  
26 of biology have been adequately covered in previous  
27 testimony. The second section of my testimony deals  
28 with experiences in Alaska relevant to impacts of  
29 oil and gas developments on caribou. This section  
30 treats both experimental studies with caribou and  
reindeer and experience gained to date with construction



1 of the Trans Alaska Pipeline and it includes  
2 recommendations resulting from both the experimental  
3 work and other experience.

4 I should also add at this  
5 point that I did not have available the testimony  
6 presented at the Inquiry in November when I prepared  
7 my own presentation.

8 Caribou "herds" or sub-  
9 populations in Alaska and the Yukon Territory have  
10 historically occupied "centers of habitation" which  
11 have received continual use regardless of  
12 population levels. These centres thus represent  
13 the optimum habitat for each sub-population. I would  
14 like to interject at this point that the term  
15 "sub-population" here is technically more correct than  
16 the term "population" because there is an exchange  
17 of breeding individuals amongst these various sub-  
18 divisions of the total caribou west of the Mackenzie.  
19 However, I will use the terms "sub-population" and  
20 "population" interchangeably in my presentation to  
21 refer to the subdivisions.

22 The calving grounds represent  
23 a persistent focal point in the annual cycle of each  
24 of these sub-populations. For example, with regard  
25 to the Arctic or Northwestern Alaska population,  
26 evidence exists demonstrating use of the same calving  
27 grounds for well over a century, during which time  
28 the population has undergone changes in numbers from  
29 highs of over 200,000 to lows of perhaps a tenth  
30 of that figure. Similar long-term use of calving





1 grounds during the course of radical changes and  
2 numbers and distribution can be documented for most  
3 of the Alaska-Yukon caribou sub-populations. Normally  
4 such fluctuations have resulted in an inward  
5 shrinking away from peripheral ranges as populations  
6 have decreased and vice versa.

7           Skoog has documented and  
8 developed the thesis that such centres of habitation  
9 include the optimum-core range for each sub-  
10 population. Although we as yet can only estimate  
11 by conjecture as to the significance of the  
12 calving grounds and closely related post-calving  
13 areas to the well-being of caribou, we can assume that  
14 anything so persistent in the midst of change must have  
15 a critical role.

16           I will come back to this  
17 point and expand a little bit on it during the slide  
18 presentation to follow in a few minutes and I believe  
19 that Dr. Calef will also deal a bit with this point  
20 later.

21           In Alaska, the Arctic calving  
22 grounds are located in foothills and drier coastal  
23 tundra dominated by Eriophorum (cottongrass) tussock  
24 vegetation. At least in the Western Arctic, the arri-  
25 val of caribou on calving grounds in large numbers  
26 has normally coincided with the first new growth in  
27 these cottongrass tussocks. Furthermore, the calving  
28 grounds tended to be islands of relatively light  
29 snow cover.

30           Calving grounds for Alaska-



Calef, Lent  
In Chief

1 Yukon caribou generally lie in isolated areas far  
2 from present human habitation centres and transportation  
3 systems. Therefore, there is little evidence on the  
4 subject of human influences. However, Skoog and  
5 myself have suggested that the total disappearance of  
6 the caribou from the Seward Peninsula-Lower Yukon are in  
7 the 19th Century may have been due to heavy hunting  
8 of calving and post-calving aggregations. I will  
9 refer to the events involving the Stees 40-Mile herd  
10 later.

11 THE COMMISSIONER: Excuse me,  
12 sorry, Dr. Lent, just trying to get the map of  
13 Alaska in my mind. Now, that would be the  
14 Yukon River running to the west and where is the  
15 Seward Peninsula?

16 A I will be showing a  
17 map in about one minute, okay?

18 THE COMMISSIONER: Okay.

19 A I think it would be  
20 better to point it out on the map, sir.

21 Alaska-Yukon calving grounds  
22 provide high, nutritional benefits and relatively  
23 good snow and weather conditions compared to those  
24 described by Banfield and Kelso for caribou populations  
25 east of the Mackenzie. This may account for the  
26 generally higher natality and summer calf counts for  
27 Alaskan populations. This will be the appropriate time  
28 to show the first batch of slides, I believe.

29 Now, perhaps, sir, we can  
30 come back to your question of starting in the upper



1 left-hand corner we have the centre of habitation of  
2 the Arctic or Northwest Alaska herd. Immediately  
3 below that at the base of the Seward Peninsula, at the  
4 base of it to the east is the area formally occupied by  
5 a large population which I referred to as the Yukon-  
6 Delta population and this is the area where caribou  
7 were essentially extirpated in the 19th Century with  
8 a few remnants remaining. The horizontal lines then  
9 show the so-called centres of habitation as the  
10 term was used by Skoog (1968) for each of the  
11 major caribou populations in Alaska.

12 Now, if we could have the  
13 next slide, please. I have modified Skoog's map  
14 to try to show the approximate location of the calving  
15 grounds of each of these populations or sub-populations  
16 in black. The point again to be emphasized is that  
17 based on historical knowledge and even on some  
18 archaeological knowledge, these calving grounds have  
19 remained as persistent focal points for the annual  
20 migration, regardless of major changes in numbers  
21 of animals. I mentioned the change in the -- the  
22 great change in the numbers of the Arctic caribou herd;  
23 another very good example would be the Nelchina herd  
24 which has also undergone ten-fold or more fluctuations  
25 in population size, even admitting the crude figures on  
26 which this is based; it is obvious that tremendous  
27 changes have taken place and yet the calving grounds  
28 as shown there continues to be used year after year.

29 MR. ANTHONY: Dr. Lent,  
30 I wonder, could you put a name on the various sub-





1 populations. You indicated the Nelchina -- could you  
2 do the same for the other --

3 A Okay, let's start again  
4 with the Arctic. That is the Arctic or Northwest  
5 sub-population, going clockwise we come to the  
6 Porcupine, the Steese 40-Mile, the Nelchina being  
7 the small one and again I must emphasize that these  
8 are not necessarily present day distribution. They  
9 represent areas into which the populations seemed  
10 to have used regardless of their population level.  
11 The McKinley herd and associated smaller herds, and  
12 finally down at the bottom, the Alaska Peninsula  
13 herd.

14 All right, I think we could  
15 go on with just a few general slides. This is the  
16 appearance of the calving grounds of the Arctic herd.  
17 These are tundra communities. You can see the  
18 Eriophorum or cottongrass tussocks. The snow melts  
19 off first on these exposing them and remains in the  
20 gullies in between.

21 The next one. This is a  
22 closeup shot of one of these cottongrass tussocks a  
23 little later on, showing the inflorescence or new  
24 growth and I will be referring to the significance  
25 of this a little later. This is, particularly in the  
26 Arctic herd, the major nutrition during the calving  
27 period.

28 The next one, please. This  
29 is a general scene of the so-called "nursery band" on  
30 the calving grounds towards the latter part of the



calving period.

Next. A close-up of dense aggregation. This is somewhat later, about a month after the end of calving, a dense aggregation of animals feeding on new green growth, also on the North Slope.

Next one. They are a little hard to see there, but there are several, many thousands of caribou out there. This again, I will be talking a little about this later, but this represents another movement which occurs later in the summer where they are now utilizing green growth which becomes available later and also utilizing this type of habitat for escape from insects.



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1                                    Another type of habitat used  
2 for escape from insects late during the summer is  
3 aufeis on river bottoms. I think that's all.

4                                    I now want to turn to the  
5 subject of winter use by caribou on the coastal plains.  
6 Now winter use of the Alaska-Yukon coastal plains is  
7 not at all uncommon. For example, I reported that in  
8 1961 about 6,000 caribou wintered within 10 miles of  
9 the coast. I should add here that this was along the  
10 north-western coastline west of Barrow. In the last  
11 two winters thousands of caribou have wintered south  
12 of Barrow, Alaska. Child reported caribou wintering  
13 in small numbers in the vicinity of Prudhoe Bay in  
14 '70 and '71, and historically caribou were taken in  
15 significant numbers by whalers overwintering on or near  
16 Herschel Island in the 1890's. Another observation,  
17 Collins in 1937 reported a large winter concentration  
18 of several thousand year the Kuparuk River. Olson in  
19 1959 reported approximately 150,000 caribou wintering  
20 across the entire central Arctic as far east as Barter  
21 Island, with approximately 30% of these in the vicinity  
22 of the Sagavanirktok River. The Biological Reports of  
23 Arctic Gas & Renewable Resources have also referred to  
24 varying numbers of caribou overwintering at various  
25 locations on the Arctic tundra and foothills. My concern  
26 is that the occurrence of these overwintering groups  
27 -- that is overwintering on the coastal plains and foot-  
28 hills -- has not been emphasized sufficiently in test-  
29 imony before this Inquiry. I might add here that since  
30 preparing this testimony I had the opportunity to





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view some rough drafts of material being prepared by Renewable Resources, winter observations in more recent years and particularly I believe '74 several hundred animals wintered on Herschel Island and other large numbers wintered on the tundra portion of the Northern Yukon Territory.

We do not understand the factors causing these variations in winter distribution. In the 1960's I believed it might be due to animals trapped due to early deep snow in the Brooks Range, plus relatively light early winter snowfall along the coast. More recent observations have not entirely supported this and other environmental factors may in fact be involved.

The importance of the coastal zone in providing relief for caribou during the insect season must also be emphasized. Geist and others have speculated on the energy losses which have been associated with insect harassment and the deleterious effects of insect harassment have also been documented by Russian and Scandinavian reindeer biologists. Relief from insects is attainable in one of three ways:

- (1) The use of aufeis and persistent snow fields;
- (2) The use of alpine and other windswept locales; and
- (3) The use of the coastal zone.

The use of the coastal zone as it occurred at Prudhoe Bay was described by Child. Short distance movements of five to 25 miles to and from the coast occur throughout the summer. Stormy weather results in movements away from the coast; warm weather,



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1 that is above 42 degrees Fahrenheit, and relatively  
2 calm, winds of less than 12 miles an hour, weather  
3 results in movements towards the coast. Animals may  
4 even enter shallow coastal waters in thousands, as  
5 I have observed near Cape Beaufort in 1971, and as was  
6 described occurring in the Arctic National Wildlife  
7 Range and eastwards past the Clarence River by LeResche.  
8 LeResche also observed that the caribou were making use  
9 of the shore-fast ice.

10 The adaptive value of this  
11 behaviour and consequently the value of the narrow  
12 coastal zone of vegetation must not be overlooked.  
13 Rapid growth during the summer is extremely critical for  
14 calves who will in all likelihood enter a negative  
15 -- that should read "negative energy balance" in the  
16 winter. Indeed, preliminary work by White and others  
17 suggests that July may be the only period when Arctic  
18 caribou are in a strong, positive energy balance. My  
19 own impression is that caribou having access to foothills  
20 and alpine areas are able to exploit diverse phenologies  
21 to extend this period of positive energy balance.

22 I have attempted to bring out  
23 evidence that the possibility exists <sup>that significant numbers</sup> of caribou would  
24 be present on the tundra during the construction period  
25 proposed by Arctic Gas. It is impossible to state  
26 the probability of this is likely under 10%, but it's  
27 high enough to bear consideration and require the  
28 development of contingency plans.

29 Furthermore, my experience in  
30 Alaska in the Arctic and sub-Arctic suggests that tight



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1 schedules , especially those involving winter operations  
2 are by and large a fiction. We have seen this time and  
3 time again, in exploration activities and in construction.  
4 The pressure to slip dates are enormous once a project  
5 has begun.

6 I will be citing some material  
7 bearing on this subject of delays in a later section of  
8 my testimony.

9 Furthermore, it should be  
10 recognized that caribou wintering south of the Brooks  
11 Range may enter the tundra zone earlier than they did  
12 in 1972, the year on which most of the Arctic Gas  
13 testimony is based. In fact, the testimony and reports  
14 bring out the fact that these were unusually late,  
15 heavy snows in the spring of both 1971 and 1972.  
16 These were both years in which large segments of popula-  
17 tions, perhaps most of the calving animals were in the  
18 Yukon Territory at calving time. We know that in other  
19 years most or nearly all the calving has occurred in Alaska.  
20 For example, as reported by Skoog in 1961, the largest  
21 calving concentration was located between the Canning  
22 and the Katakturak Rivers to within 10 to 15 miles  
23 of the a coast. Although compete details are not  
24 available it seems likely from his description that  
25 large numbers of animals were moving on the tundra and  
26 entering the calving area quite early in May. The  
27 timing of such a movement could overlap a scheduled  
28 demobilization phase. An earlier spring movement such  
29 as that observed by Munro in '53 could also bring  
30 large numbers of caribou into contact with pipeline





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1 construction. Any construction or demobilization or  
2 maintenance activities during pipeline operation  
3 occurring in calving or post-calving areas, when  
4 caribou are there, can be expected to lead to increased  
5 caribou mortality. Desertion of young calves can be  
6 caused by direct human disturbance on the ground or  
7 with aircraft, and the presence of barriers to movement  
8 could cause separation or slowdown in the rate of move-  
9 ment of calves, especially those born late in the  
10 season. Besides these direct effects, any barrier that  
11 results in retardation or deflection of movement will  
12 decrease optimum utilization of the environment. In a  
13 migratory species, such as the caribou, optimum use  
14 of the Arctic environment naturally depends upon being in  
15 the right place at the right time. For example, rapid  
16 changes in vegetative phenology, take place in spring  
17 and early summer. By appropriately timed movements,  
18 caribou take maximum advantage of these changes and the  
19 spatial differences in vegetative phenology. The adaptive  
20 value of appropriately timed movements during the insect  
21 season has already been referred to. Bergerude and others  
22 have also emphasized this. Caribou can be expected to be  
23 present along the tundra portion of the so-called prime  
24 route in maximum numbers during this summer period when  
25 compressor station construction and related activities  
26 are occurring.

27 I'd like to, Mr. Commissioner,  
28 elaborate a little bit more on that, but I would like  
29 to -- my contention is that precise timing and spatial  
30 position is more critical for caribou in the calving



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 In Chief

1 and summer periods than in the winter. For example, we  
 2 know from recent work in Alaska and the work of Scotter  
 3 in the Mackenzie Delta that cottongrass, that's the  
 4 species which I just referred to, forming the major  
 5 part of the calving areas, has high protein content in  
 6 the new growth, that is in the inflorescence which I  
 7 showed in the slide, has high protein content in June.  
 8 That is during the calving period.

9 This value declines during  
 10 the summer. In other words, there's a period of time  
 11 when there are maximum nutrient values, in this partic-  
 12 ular species on the calving grounds. Another example,  
 13 Soviet reindeer biologists have demonstrated very high  
 14 protein values in browse species available to reindeer  
 15 later in the summer. These species would be available  
 16 in the foothills as opposed to the coastal plain, and  
 17 in the mountains. In short, there are very rapid changes  
 18 occurring in the availability of various nutrients in  
 19 vegetative forms distributed over space and time.

20 Of course variations in the  
 21 precise location of calving concentrations and the  
 22 timing of related movements do occur from year to year.  
 23 The implication has been made in the applicants reports  
 24 and testimony that because caribou accommodate to  
 25 variations in natural conditions, they will have no  
 26 difficulty accommodating to man-made changes in the  
 27 environment. This concept is extremely misleading.  
 28 Anything that interferes with their ability to accommo-  
 29 date to natural variation will reflect undesirably on  
 30 population productivity. One cannot extrapolate and assume



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1 that they will be able to accommodate to natural  
2 variability plus man-made factors. Environmen tal  
3 assessments cannot lose sight of the fact that any  
4 man-caused mortality is supplemental to natural  
5 mortality. The effects are to be summed and in the case  
6 of caribou at least, they should not be assumed to be  
7 **density** dependent.

8 Q Dr. Lent, would you now  
9 describe the experimen tal work in Alaska with pipeline  
10 simulation?

11 A Yes. This experimental  
12 work with caribou and reindeer was undertaken to  
13 provide answers relative to design features of an oil  
14 pipeline , in other words, the Trans-Alaska Pipeline  
15 system which I refer to in short as TAPS in the rest  
16 of my testimony, and also oil feeder pipeline systems  
17 and associated structures. However, the general behavi  
18 -our insights are applicable to gas pipeline systems  
19 and are certainly applicable to possible future oil  
20 developments in the Mackenzie Delta or oil pipelines  
21 which may parallel proposed gas pipelines.

22 Now, the Prudhoe Bay oil field  
23 is situated on historic range of caribou. The general  
24 area is an important summer range, insect relief  
25 habitat, and lately calving grounds for a small popula-  
26 tion of approximately 3,000 animals.





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1                   The oilfield is also  
2 characterized by occasional large scale and intermittent  
3 movements of thousands of caribou. These movements may  
4 coincide with major population shifts between the Arctic  
5 and Porcupine caribou herds, to the west and east,  
6 respectively.

7                   We, two pipeline simula-  
8 tions were constructed at Prudhoe Bay with various  
9 experimental methods of passage for caribou movements  
10 on their summer range. Studies of the behavioral  
11 responses of caribou to the structures were conducted  
12 during 1971 and 1972 to appraise pipeline design  
13 features. One of these simulations involved modes of  
14 construction for small diameter feeder pipelines running  
15 adjacent to gravel road pads such as will undoubtedly  
16 form the gathering systems in any Arctic oil and gas  
17 field. I should emphasize again that these studies  
18 were not designed to answer questions about short or  
19 long term effects on caribou populations but rather  
20 responses to specific structures, particularly crossing  
21 facilities. I will go into a little more detail on  
22 the exact nature of these simulations, the construction  
23 etc. I think however it is better to leave that until  
24 we show the film which is coming up because as the  
25 saying goes onemoving picture is worth several words.

26                   However, before showing the  
27 film, I want to summarize some of the results since  
28 it may not be possible to do that during the course of  
29 the film as well.

30                   The majority of caribou



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approaching these pipelines in 1971 and '72 showed a tendency to avoid the structures. At the simulated 48-inch pipeline, of a total of 5,599 animals observed approaching the structure in '71 and '72, 994 (17.5%) used the ramps; that is, used them as crossing facilities; 273 (4.9%) used the underpasses; and 36 (0.7%) passed beneath the fence in order to gain access to the opposite side of the simulation, whereas 1,924 (42.4%) moved to the terminals of the structure. At the feeder pipeline mock-up, of 1,362 animals observed at the simulation, 92, (6.8%) passed beneath the pipe; 113 (8.3%) used the low-profile ramp. to cross the pipeline; 129 (9.5%) caribou reversed their movements, whereas 1,028 (75%) animals moved around the ends of the pipeline to the other side.

Now, I also want to add here that the interpretation of our results given by Dr. Banfield in his testimony at Whitehorse. That appears on Page 7,464 are incorrect. Specifically we did not obtain greater crossing success at the feeder pipe elevated road simulation. Also, he apparently interpreted that this entire simulation consisted of four parallel feeder pipes adjacent to a road. This again is incorrect as you will see in the film. Only part of the simulation was composed of four parallel pipes. Most of it contained only one.

Now, the crossing success showed significant positive correlation with density of biting insects. That is, the proportion of successful crossing to total encounters was highest with movements towards the coast associated with fair weather



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1 and high insect densities in the air. This was  
 2 especially true of ramp use.

3 An additional pipeline  
 4 simulation was constructed on the Seward Peninsula  
 5 where semi-wild reindeer were available all year-round  
 6 as experimental subjects. Thirty-two inch diameter  
 7 dredge pipe was used at this location. An elevated  
 8 section and a large gravel ramp were constructed.  
 9 Experiments involved both observations of uncontrolled  
 10 movements towards the simulation and attempts to  
 11 force crossing by driving animals towards it. Results  
 12 achieved were generally similar to those obtained at  
 13 Prudhoe Bay.

14 Outside of the season of  
 15 insect harassment there was only one occasion when a  
 16 large number of reindeer used the ramp. Drifting  
 17 snow against the cold pipe formed natural ramps which  
 18 were used in winter if the pipe was entirely or nearly  
 19 entirely covered. At other times in winter, the caribou  
 20 appeared to react to the contrast of the black dark pipe  
 21 against a white background and stayed farther away than  
 22 at other seasons.

23 And I want to add here  
 24 that this is a well-known stimulus contrast effect  
 25 referred to by Geist in his report on harassment; that  
 26 is document number 359.

27 The fact that the only  
 28 large group crossing of the ramp occurred on the last  
 29 experimental run suggests a possibility of individual  
 30 habituation. Similarly suggestive results were obtained





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1 at Prudhoe Bay, but this subject requires further  
2 investigation.

3 Where total burial is not  
4 possible, and again I will repeat of course that this  
5 was referring to oil pipelines, ramps appear to be the  
6 preferable method to facilitate crossing of caribou  
7 over pipelines.

8 On the tundra, underpasses  
9 are generally avoided and infrequently used by  
10 caribou to negotiate the obstructions. Ramps of  
11 circular shape and gradual slope on a six to one ratio,  
12 are most effective but also require the greatest amount  
13 of gravel.

14 Short sections less than  
15 100 feet such as; excuse me, short sections with less  
16 than 100 feet of buried pipe are also likely to have  
17 limited effectiveness as caribou once moving parallel  
18 to the pipe/<sup>will</sup>tend to pass such gaps and that again  
19 is illustrated in the film and I think this would be  
20 an appropriate time to look at a moving picture in real  
21 live colour. I will try to narrate this film. I  
22 hope eventually to have a sound track on it but that  
23 is not available yet. I also want to say that this is  
24 an amateur production.

25 (Film Presentation)  
26  
27  
28  
29  
30



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1 I want to proceed then with  
2 some of the recommendations which came out of these  
3 studies. These are slightly modified with a little  
4 bit of personal input, modified from the reports  
5 resulting from these studies.

6 (1) Mapping of traditional trail systems from direct  
7 aerial observation or from aerial photography (including  
8 high altitude photos) and placement of crossing  
9 facilities accordingly). In other words, it's no good  
10 building crossing facilities unless you have a pretty  
11 good chance that caribou are going to be using it.

12 (2) Taking advantage of natural terrain features such as  
13 river channels, funnelling effects of lakes, etc. in  
14 placement where distinct trail patterns are not discern-  
15 ible.

16 (3) Placing crossing facility as nearly perpendicular to  
17 these movement pathways as possible. Animals approach-  
18 ing at acute angles are far more likely to by-pass  
19 crossing provisions, and this is on the film.

20 (4) Placing ramps at locations where animals will  
21 approach and view the structure from a rise so that  
22 they have a view over the ramp before actually crossing  
23 it; in other words, a chance to see what's on the  
24 other side.

25 (5) Placing small diameter feeder lines in sections  
26 alternating on either side of the road, what I call a  
27 zig-zag configuration. You can either zig-zag your pipe  
28 or you can zig-zag your road. These feeder lines then  
29 would pass under the road through the pad. This helps  
30 to avoid situations such as you saw on the film, where



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1 animals coming up on the road are blocked from leaving  
2 by parallel pipe on the opposite side. In such cases  
3 they frequently move along the top of the elevated  
4 surface. When the pipe crosses under, they then have  
5 an opportunity to continue in their preferred direction.  
6 Avoiding black or very dark colors on structures includ-  
7 ing pipe will likely to be encountered in snow seasons.  
8 Visual contrast seems to be disturbing.  
9 Locating and designing structures so as to minimize  
10 snowdrifting effects not only to aid human use but to  
11 reduce the possibilities of entrapment of young calves  
12 in early summer.

13 And that concludes the  
14 recommendations resulting from this experimental work.

15 MR. ANTHONY: Mr. Commissioner,  
16 I would like to table two reports. One is a report  
17 entitled:

18 "The Reaction of Reindeer to a Pipeline  
19 Simulation at Penny River, Alaska,"  
20 an interim report by Kenneth M. Child and Dr. Lent  
21 dated May of 1973. The second being entitled:

22 "The reaction of barren ground caribou to  
23 simulated pipeline and pipeline crossing  
24 structures at Prudhoe Bay, Alaska,"  
25 prepared by Kenneth M. Child. I could give these the  
26 next two exhibit numbers.

27 Mr. Commissioner, I now  
28 propose to build on what has been said and move to  
29 a further subject. Would you like us to proceed?

30 THE COMMISSIONER: Yes, well





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1 certainly.

2 M R. ANTHONY: Dr. Lent, would  
3 you indicate what you feel this Inquiry can learn from  
4 the Alaska experience with respect to the interaction  
5 between wildlife and pipeline simulations in pipeline  
6 experience.

7 A Yes, I'd be very glad to.

8 THE COMMISSIONER: If you're  
9 moving onto another subject, do you want to -- were you  
10 indicating we should adjourn now, or do you want to  
11 carry on tonight, or what?

12 MR. ANTHONY: Well, I was going  
13 to suggest that if you wanted to adjourn before  
14 completion of the evidence, it would be an appropriate  
15 place to do this.

16 THE COMMISSIONER: Oh, I see.  
17 Well, maybe we should. Would that be all right, Mr.  
18 Ryder?

19 All right, so we can finish  
20 Dr. Lent tomorrow. As he said, he wants to return  
21 to Alaska. Do you want to start earlier in the morning  
22 or what should we do?

23 MR. ANTHONY: After Santa Claus  
24 visits this evening I don't know how we're going to  
25 be tomorrow morning but I'm prepared to commence at any  
26 hour convenient.

27 THE COMMISSIONER: Well, let's  
28 make it 9:30.

29 (2 PRELIMINARY PLANNING DIAGRAMS MARKED EXHIBIT 388)  
30



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1 (QUALIFICATIONS, LIST OF REPORTS & EVIDENCE  
2 OF DR. LENT MARKED EXHIBIT 389)

3 (QUALIFICATIONS, LIST OF REPORTS & EVIDENCE  
4 OF DR. CALEF MARKED EXHIBIT 390)

5 (ANALYSIS OF ENVIRONMENTAL STIPULATION COMPLIANCE  
6 ON TRANS-ALASKA OIL PIPELINE MARKED EXHIBIT 391)

7 (REACTION OF REINDEER TO PIPELINE SIMULATION  
8 AT PENNY RIVER, ALASKA MARKED EXHIBIT 392)

9 (REACTION OF BARREN GROUND CARIBOU TO SIMULATED  
10 PIPELINE & CROSSING AT PRUDHOE BAY, ALASKA MARKED  
11 EXHIBIT 393)

12 (ASSESSMENT OF PROJECT STATUS, TRANS-ALASKA  
13 PIPELINE, MARKED EXHIBIT 394)

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15 (PROCEEDINGS ADJOURNED TO DECEMBER 18, 1975)  
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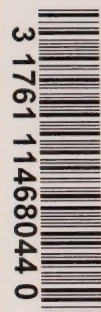












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